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## FORESTRY,

## AGRICULTURE, SHIKAR & TRAVEL

EDITED BY

J. S. GAMBLE, M.A., F. L. S.,

CONSERVATOR OF FORESTS, AND DIRECTOR OF THE FOREST SCHOOL, DEHRA DÚN.

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THE

# INDIAN FORESTER.

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## A plea for Protected Forests.

Mr. Baden Powell in his Manual entitled "Jurisprudence for Forest Officers" has given it as his opinion that Protected Forest is not a permanent Forest Estate, that it only serves to prevent the rapid deterioration of growth where conditions are as yet undeveloped, and where permanent, *i.e. Reserved* forests, cannot be decided on ; and elsewhere in the same Manual he expresses the hope, if it be remembered aright, that Chapter IV of the Indian Forest Act will be expunged from any future edition of the Act which may be compiled for the whole of India and Burmah. It is doubtful whether his suggestion will ever be carried out : should, however, such a step be contemplated, Government, it is hoped, will pause before taking it, as climatic and other conditions vary so considerably on this vast continent that a universal code would scarcely be applicable to every locality.

In all Provinces where forests depend on a rainfall, Reserves undoubtedly are desirable ; but what about those localities where rainfall is almost an unknown factor, (at any rate for all practical purposes) and where sylviculture is dependent entirely on river floods. A part of India exists where such a condition of things prevails, and probably it will not be out of place, and may be of interest, to describe some of these conditions and show how the maintenance of forests is affected thereby, and how the requirements of Chapter IV of the Act seem specially adapted to meet their case.

The forests under notice are situated along the river on alluvial land and extend along both banks for 150 to 200 miles, not however forming an unbroken chain of vegetation, for here and there Government waste and Zemandari property intervene. As may be imagined, this alluvial soil suffers considerably from exposure to the wearing action of the stream. In the cold weather (November to February) the river is low ; nevertheless active in eroding its banks. At this period, the erosion is gradual, and its progress can be both observed and heard ; in the stillness of the night the falling in of the overhanging fragments of a bank are distinctly audible like reports of heavy cannon.

During May, the waters begin to rise in vast volumes, soil is rapidly eroded, and belts of jungle two and three hundred yards deep containing *Populus euphratica*, *Acacia arabica* and *Tamarix gallica* are rolled over and over into the stream.

A little later, the river overflows its banks, and floods the country within the limits permitted by the Irrigation Department; and when it falls, generally in September, it will often be found to have cut a new channel for itself. This "erratic wanderer" at times makes a detour bisecting a large forest and leaving a wide gulf between the two parts. At another time, a slice removed from one forest is left as it were as an accretion to another on the opposite bank, or if the land opposite be Zemindari or Government waste it is claimed by either of the latter. In this manner, the riverside areas are constantly fluctuating, and diminishing, and not unfrequently vanishing.

In view of such ever-changing and unstable conditions, the question arises whether the constitution of Protected instead of Reserved Forests in similar circumstances is not desirable, and whether, as a matter of fact, these very conditions in consequence of the value of the property, do not make it incumbent on the Legislature to provide for the formation of a class of forest which can cope with these changes. The provisions of Chapter IV. seem to meet the case entirely.

A Reserved Forest is created after elaborate and refined demarcation and settlement under the auspices of a Special Officer at considerable expense, and much time often elapses between the notification under Section 4 and the final one under Section 19. Four and five years have been known to elapse in some instances. In the interim, with such conditions existing as described, it might be found, when the notification under Section 19 came to be made, that the greater portion of the forest had disappeared, or that it was entirely *non est*. The forests which now exist are all Reserves, and were made so under Chapter V, Section 34 when the Forest Act came into force in 1878.

A Protected Forest, on the contrary, can be formed by one sweep of the pen and without the aid of special means. A Forest Settlement Officer is not necessarily needed to demarcate and enquire into it, *vide* Chapter IV, Section 28, clause 3, and the important feature is, that exploitation in it can commence immediately after notification. It can be worked quite as efficiently as a Reserved Forest, the only difference being that the working plan would require Government sanction, *vide* Chapter IV, Section 29. But to create a permanent structure on land which is *ipso facto* temporary is rather unreasonable. The folly of such a proceeding was forcibly illustrated recently when important defence works were erected on the bank of the river one season, only to be swept away the next; and yet, indeed, some authorities would construct permanent forest estates to be swept away in like manner. The removal of Chapter IV from the Act would mean nothing more than this.

In view of such ever changing and unstable conditions as described, it may well be asked, how came extensive forests to be formed at all, and if they last only a few seasons, what value can the growth in them be from a forest point of view ?

The facts are that formerly the river floods were allowed to spread over the greater part of the country, except into towns and large villages which were surrounded by embankments, silt was distributed uniformly over a wide area, and the bed of the river followed a serpentine course merely flowing over the country as water will if made to run gently over a tolerably level surface. It sought, at intervals of long duration, a new channel as all inundation rivers will ; but this channel was not subjected to any deep scouring out process, as a more rapid and direct flow, under similar circumstances, would cause.

A dense forest, for instance, was not carried away bodily, its obstruction rather causing the river to break and form an island or make a wide detour, round it.

Erosion, under such conditions, though of course present, was imperceptibly felt, and the changes wrought were so gradual that canopied forest had time to form and establish itself.

The drawbacks, however, attending a river whose course was liable to fluctuate in this manner and whose floods meandered here there and everywhere, were agricultural uncertainty, insecurity of life and property, and general unhealthiness of the District. To remedy this state of things, the P. W. D. erected " bunds " on either side of the stream and substituted a system of irrigation by a network of canals for the District which have undoubtedly benefitted the country ; but while all other interests have been served, the forests undoubtedly have suffered. These forests outside the " bunds," for instance, are all drying up, artificial irrigation as it is found, is too expensive to maintain them, and, in a few years, the place thereof will know them no more ; but it is with regard to those within the bunds that it is sought to invite attention.

The constantly occurring changes in the forest areas here as previously explained, which are almost kaleidoscopic in their character, have only begun to be be marked since the development of the " bund " system. The embankments often run through a forest or sometimes form an outer boundary of a forest on both banks. The river, in the cold months, is a narrow channel between. In the hot weather, however, it rises and forms a mighty roaring flood whose waters get heaped up against the embankments, some times so high as to spill over them. The banking up of the waters contributes, as is natural, to the more rapid deposition of silt at the sides than in the centre of the stream where the current is rapid. The surface of the land at the sides therefore gets quickly raised ; but the bed of the stream itself is slowly being raised too, and when it has risen so high that the water is no longer able to be retained in the same channel, the river swerves and seeks a new course scouring its way through thickly deposited silt and jungle, and clearing everything before it as chaff before the wind.

It may be gathered that the time arrives when this "wanderer" is under the necessity of abandoning the new channel thus formed; it then leaves a fresh alluvial deposit in place of the canopied forest which previously existed. This lasts for about seven or eight or perhaps ten seasons, when the stream returns probably to its old course to perform the same operation of destruction as before; but of course on a much minor scale In this way the river, being hemmed in, dances about from bank to bank within its specified limits, affording no time for the formation of any large timber trees. A complete change, therefore, is taking place in the character of the forest, which only the Forest Officer sees, and the disastrous effects of which it is difficult to make others fully understand. What is needed of course is, to give the river space for far 'greater expansion than it at present enjoys' this will dimish its velocity and force, and mitigate the rapid changes that now occur. In the interests of the public weal, the "bunds" must stand, otherwise from a forest point of view they ought, of course, to be done away with altogether. As regards the use to which these temporary forests can be put, it may be mentioned that they yield poles and rafters and a large quantity of firewood which is utilized as fuel for Steamers, for the Railway Locomotives, and for various mill industries.

*Tamarix gallica* and *Populus euphratica* seedlings are to be seen in countless thousands on a bank which has been recently abandoned by the river, and in less than half a dozen years a first coupe may be made from them. As an instance of the rapid reproduction of Tamarisk, coppice shoots, 19 months old, have reached a girth of $5\frac{1}{4}''$, and instances of girths of 3" and 4" are not uncommon.

The question of large timber, however, is one of very serious importance, for a considerable income is derived from this source, which, if the present irrigation plans continue, will entirely disappear in a few years.

G E M.

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## Injury by Insects and the value to Forests of the Enemies of those Insects.

The more we gain an insight into the fact that not only are the means at our disposal to prevent injury by insects quite inadequate, but also that the artificial working of the forests may in itself favor an excessive reproduction of certain insects, so much the more we must acknowledge the necessity of an ability to recognize the enemies of such insects and of ascertaining in what way they are helpful. The enemies of an insect may be divided into external and internal enemies, and of the former, bats are amongst the most important. These animals are indeed seldom

mentioned as being destructive to insect life, but on account of their avidity and owing to the fact that they feed at night and therefore on insects which are not exposed to destruction by birds, they become of the greatest consequence. Many of the insects most harmful to forest growth only fly by night and are protected during the day by their color which is assimilated to the bark of the tree on which they feed, and it has been frequently noticed that excessive reproduction of such insects is followed by an abnormally large gathering of bats in the forests affected. As bats only feed on the wing, they can only destroy full grown insects, and do not affect in any way the eggs or immature insects of any species ; on the other hand they devour enormous numbers of mature females, which, as we will show later on, seem to be protected against the ravages of birds, and thereby prevent the birth of thousands of caterpillars and consequent harm to forest growth. It is an error common to those who do not observe, to assume that the number of bats is insignificant, and that therefore their influence on insect life is small. This however, is not the case : the number of birds is generally overestimated because they are for the most part diurnal in their habits and also noisier than bats. In point of fact, bats are in most localities more numerous than birds. Other insect-eating animals are, from the forester's point of view, of much less importance than bats ; they are probably as ravenous as bats, but as they feed on immature insects whose chance of producing young is much smaller than that of the mature insect, the good they effect is not so marked. Insectivorous animals are of much more importance in Agriculture than in Sylviculture, for in the former, the injury by insects is mainly accomplished by the grub of the Cockchafer etc. Amongst other Mammalia which feed on insects may be mentioned the fox, badger, martins, rats, mice and rodents ; these animals are mentioned only to complete the list of other insect enemies, but they have no influence whatever on the numbers or increase of insect life.

We cannot, however, pass over the value of birds in so cursory a manner. It is a well-known fact that many species of birds feed themselves and their young on insects and caterpillars, which are harmful to vegetation ; and we all admit that the presence of insectivorous birds in a garden is a subject for congratulation. In agriculture, birds play a part of some importance in preventing the excessive increase of insect life; the almost universal destruction of hedges which has taken place during the last few years was predicted as certain to be followed by an enormous increase in insect life. In point of fact, although birds were driven to find shelter at a greater distance from cultivation, there was no marked increase in insect life discernible. The value of birds as insect enemies is often overrated. For instance, the number of insects varies enormously from year to year ; the number of birds remains fairly constant ; it is evident therefore that the ordinary number of birds cannot produce much effect on an abnormal number of

insects produced in any given year. The answer to this argument is that birds flock to the locality where insects are abundant; but this is not by any means definitely proved; observations have been made by trustworthy naturalists of a most contradictory nature. It must also be remembered that many insects are more or less perfectly protected against birds and that amongst these are many of the most harmful. Many experiments and observations are recorded in reference to the reasons of birds for avoiding certain insects, and to discover why some insects are devoured by certain species of birds and not by others. It is probable that insects which are so avoided are poisonous to the species avoiding them; but *Zenzera Aesculi* is avoided by all birds, who show the greatest anxiety in the presence of this moth. Butler attributes this astonishing fact to the coloring of the wings of this insect; and it is remarkable that a similar coloring is present with the "Nun" which is seldom or never attacked by birds, showing that in the latter instance the coloring is purely protective. The author here enters on a long dissertation on the numbers of individual species of birds in Europe, and values each species separately with regard to its power of destruction of insect life. These details are not of great practical importance for an Indian Forest, so long as we are acquainted with the result arrived at, which is briefly, that in spite of all the good done by birds, their influence on insect life is not sufficient to prevent any abnormal increase thereof. Such an increase is provoked by favorable climatic influences alone and superabundant insect life is destroyed by adverse climatic or other influences alone. A single fruit tree, an isolated patch of forest, a garden, may indeed be benefited by the action of birds but in large tracts of forest they have no practical effect. In fact in the commotion raised in the last few years regarding protection of birds, too much stress has been laid on their value as destroyers of insect life. The great insect plagues which have devastated large areas of forest have been stayed by parasites and climatic influences. Ratzeburg remarks that the *ichneumon* flies have more value as insect destroyers than birds, and Pfeil writes that if the Ichneumonidæ could sing, much useful sympathy would be diverted to their species. In this, all must be agreed that in such discussions a hard and fast line must be drawn between sentiment and fact, and whilst bitterly regretting the wholesale destruction of birds and rejoicing over the protective laws passed for their benefit, it must at the same time be acknowledged that their utility has been much exaggerated.

If birds have, owing to the fact that they are so agreeably remarkable, succeeded in attaining an unmerited position in regard to their capabilities of destroying insect life, this cannot be said to be the case with lizards. The number of species is indeed small, but the aid afforded by this animal should not be undervalued as the number of individuals is very large. In sunny spots in forests there are often more lizards than birds, but it is difficult to see

them, so secretive are their habits. Moreover, the number of lizards depends much on the locality: for instance in Northern Italy, lizards are probably ten times as numerous as birds; in South Germany the latter are much more common. The lizard does not go far from its home, but as its beat is restricted, so its search for prey is extremely careful: every leaf and twig is inspected. The food varies with the season of the year and is composed of harmless as well as harmful insects; but although in certain circumstances lizards may be useful, yet their action can have no more practical effect than that of bats and birds. Amongst amphibious animals, frogs and toads feed on insects. The stomach of the common frog is often full of insects both harmful and harmless, but frogs do not as a rule frequent forests, with the exception of the tree frog which is comparatively rare in Europe, though it is apparently frequent in the tropics. In Japan, for instance, tree frogs appear to be more abundant in certain localities than birds.

Vertebrate animals, as enemies of insect life, perform, however, an insignificant *rôle* compared to that filled by the invertebrata. Most of these latter belong to those classified as *external* enemies but there are a few which can be reckoned as *internal*. Amongst others, the ants, representing an important factor in the forces of nature, rank as enemies to insect life. Ants have indeed been artificially introduced into forests devastated by *Cnetocampa pinivora*, with the result that though the ants killed such larvæ as came in their way, they ultimately left the forest. Such experiments are useless, unless the relationship of ants and other insects are better proved. It has been remarked that ants live in the same trees with all kinds of insects and caterpillars and do not molest them, and the conclusion has been arrived at, that ants in ordinary circumstances do not prey on insects, but only kill such individuals as may be sickly or are found in abnormal circumstances such as fallen from trees, &c. If this were not the case it is probable that ants would so increase that in a short time they would dispose of the rest of the insect world. The term 'ordinary circumstances' must of necessity have only a limited application, but the conclusion to be arrived at is, that ants do not seriously affect insect life so long as it is vigorous, but should the insects be weakened by climatic influences or other causes, this is taken immediate advantage of by the ever ready ant. Mention may be made of certain wasps which prey on insects, but they have no special importance from a forest point of view as their food consists equally of harmful and harmless insects. Some of the Hemiptera are also useful as feeding on caterpillars, especially *Tropicoris rufipes*; in Europe, however, the Hemiptera are of little significance although they are apparently of more importance in tropical countries. The same may be said of many other insects such as grasshoppers, beetles, etc., etc. It is not doubted that such insects do feed on insects harmful to forest growth, but they do not confine their exertions to such species. Amongst the many thousands of species of insects to be found in

European forests, scarcely 100 species are harmful and only about 20 are capable of causing widespread devastation ; it is therefore evident that the action of invertebrate enemies to insect life cannot be compared with that of the internal enemies of insects. These internal enemies are divided into animal and vegetable life, and to understand the subject correctly, some old errors and absurdities, up till now believed in, must be abandoned ; and although it is not the aim of this paper to abolish these beliefs, their untruth must be exposed where necessary. For instance, Ratzeburg arrived at the extraordinary conclusion that the parasites of the *Ichneumon* and *Tachina* only affected unhealthy caterpillars; so that they were of no utility as destroyers of insect life. This has been proved to be utterly false, as infected caterpillars after being operated on have produced healthy moths ; moreover, in spite of the presence of parasites, moths have been formed before and after the development of the perfect parasitical insect. It is astonishing to find during the prevalence of an epidemic, that hardly any caterpillars contained parasites, and on the other hand to observe that it was not found possible to inoculate with fungoid growth such insects as already contained parasites. The explanation of this need not be entered upon here ; it follows on biological laws and is merely mentioned to show that animal and vegetable parasites do not work against each other and that it cannot be taken as an absolute fact that parasites only attack either sound or unsound individuals. The slow increase of parasitical insects has been brought forward as a proof of their low value as insect destroyers. In the first year of abnormal increase of harmful insects, parasites cannot, it is true, proportionately increase ; the increase of the parasite must follow and cannot be coincident with the increase of his supporter ; but in the second year the proportion of deaths from parasites largely increases, whilst in the third the insect on which it preys is practically exterminated. The following statistics on this subject may may be interesting. During a period when *Gastropacha pini* was present in normal numbers, only 2 per cent were infested by parasites; whereas 26 per cent were infested during a period when the numbers were commencing to increase. At the end of a plague of these caterpillars it was found that of one hundred specimens, 32 were suffering from an epidemic and 54 from parasites. The great value of the *Ichneumon* and *Tachina* is that they confine their action to a single or a few species. The author here gives a paragraph on the question of the frequency and death of the *Ichneumons*, he finds that the frequency of the parasite rises and falls with the frequency of the carterpillar. He points out that this relationship does not exist between the vertebrate enemies to insect life and their insect food, from whence it happens that birds may be able to exterminate a species that has been almost destroyed by disease, or adverse climate, whereas they would produce no effect in the numbers of the same species when abnormally frequent. The parasitical insects are enabled by their power of producing a

very numerous progeny, to adapt themselves easily to an increase in number of the insects which support them. It has been proved that one larva of a butterfly can afford nourishment to several thousand parasites and as we may assume that all the parasites found in one caterpillar are the offspring of one mother, some idea of the fecundity of these insects may be obtained. Although it has sometimes happened that parasitical insects have directly prevented an abnormal increase of a particular species of insect, this is not generally the case: as a general rule the plague of insects is terminated by an epidemic. We have already pointed out that the great value of parasitical insects depends on the fact that they confine their attacks to harmful insects; and in regard to fungoid growths this is still more marked. Most epidemics occur amongst larvæ when these are produced in abnormal numbers, and in most instances in the case of harmful insects, with one notable exception however, that of the silkworm. When it was first discovered that insect epidemics were due to fungoid growth, many different maladies were distinguished which were, however, finally discovered to be different forms of a few fungi. Pasteur for instance only distinguishes four forms of the silkworm disease. It will be sufficient here to remark that the same mistake has been made in reference to fungoid disease of insects, as was made about parasitic insects; it was thought that the disease only attained importance when insect life was superabundant. It was recognized that the epidemic in conjunction with parasitic insects brought to an end the devastation wrought by insects, but only careful observers noted the spread of the epidemic before the abnormal swarming of the harmful insects had reached its zenith. The result of the coincident swarming and plague was that the former was prolonged so that it only reached its period of greatest activity when the fungoid germs had also reached the highest reproductive power. In one locality, the percentage of plague stricken caterpillars rose within 10 days from 15 to 51 per cent., a proof of the destructive nature of the disease. There are, moreover, certain diseases which are hereditary, and which, as it is known in the case of the silkworm result in feeble and deformed offspring. At any rate, the effect of such a plague in harmful insects is very deadly, and before a species can recover itself, the forest receives a well earned rest for its recovery. The result of observations made on insect epidemics shows that the idea of preventing the devastation by artificially inducing disease is worthy of attention. The author here devotes some paragraphs to the question of cultivation of bacteria, quoting suitable insects for this purpose. He is certain that much more effective results are to be obtained in this manner than by the wholesale protection of birds which has no effect whatever. The object of the paper is to direct observation and enquiry into the points discussed and any facts which prove or disprove the statements made, will serve a useful purpose in clearing up the subject.

DR. ADALBERT SEITZ,

 GIESSEN.

# Influence on the vegetation of a forest of the removal of dead leaves from the soil.

Under this head, experiments extending over a period of several years have been carried out by the Prussian Forest Experimental Station, the results of which have recently been communicated to a contributor to the *Révue des Eaux et Forêts* by the Director of the "Station," Dr. A. Schwappach.

The experiments were made in two forests of beech, situated in totally different localities, one being in hilly ground near Tréves at an altitude of some 1,800 feet and on a soil of poor or medium quality, the other being near Stettin on a fertile diluvial soil with a sub-soil of marl.

In the first case, the areas experimented with were perfectly divided into five equal portions, one portion being allowed to remain untouched; from the second dead leaves were removed every year; from the third every two years and from the fourth and fifth every four and six years respectively.

In the second case, the areas were divided into two portions, the ages of the crops on the three different areas so divided being different. From one half of each area, dead leaves were removed annually, the other remaining untouched.

Tables are appended giving the perodic increase in volume of the crops on each sub-division of the area; in the first case for five periods of six years and in the second for two periods of nine years. These tables show that in the forest growing on poor soil, there was an average loss of growth in the volume for the last three periods of 51 per cent when the dead leaves were removed every year

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| „ 40 | „ | „ | „ | „ | „ | „ | „ | 2 years. |
| „ 22 | „ | „ | „ | „ | „ | „ | „ | 4 „ |
| „ 9 | „ | „ | „ | „ | „ | „ | „ | 6 „ |

In the crops growing on good soil, the loss due to the annual removal of dead leaves during a period of 18 years was

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25 | per cent | in | the | crop | aged | 50 | years (in 1873). |
| 21 | „ | „ | „ | „ | 77 | „ | „ |
| 11 | „ | „ | „ | „ | 74 | „ | „ |

These figures would seem to show conclusively that the removal of dead leaves is more harmful on poor soils than on fertile ones, that on the former the practice may diminish the production of wood by more than one half. Also that the influence of the removal of the leaves is greater, the more frequently and the longer the practice is continued.

# Dispersion of seed by birds.

*(From the Révue des Sciences naturelles appliquées).*

Many birds travel more than 400 metres a minute and are thus able in a very short space of time to carry to distant regions the seeds of plants on which they feed.

Mr. PISTONI of Messina has been making observations on this subject in Sicily, where plants peculiar to northern climates are to be found alongside the indigenous plants of the country. On this island, birds seek for and disseminate chiefly the following species :—

| BIRDS. | PLANT ON WHICH THEY FEED. |
|---|---|
| Corvidæ : Corvus frugilegus, Cornix monedula. Picus Graculus, Garrulus glandarius. | Fruits of Prunus avium. Olive. Fig, Date. Dwarf palm, and Cornus Mas. |
| Oriolus Galbula. | Phillyrea variabilis. Prunus Cerasus. |
| Sparrow and Chaffinch. | Arbutus Unedo. Morus nigra and alba. Linum usitatissimum and strictum. |
| Canary (Serinus hortulanus). | Cruciferæ. Koenigia maritima. |
| Emberiza Schœniculus. (Rosy Ortolan). | Phalaris Canariensis. Setaria italica. Panicum miliaceum. |
| Thrushes (Turdus pilaris, torquatus). | Vaccinium Myrtillus. Myrtus communis. Rubus discolor and tomentosus. |
| Hawfinch (Coccothraustes vulgaris. | Mespilus germanica. Cratægus Azerolus. |
| Turdus viscivorus. | Mistletoe. |
| Warblers. Sylvia hortensis, cinerea, atricapilla, conspicillata. | Figs—cultivated in wild form. |
| Nightingale. Philomela luscinia. | Strawberry. |
| Robin. (Erithacus rubicola). | Elders. Sambucus nigra and Ebulus. |
| Tomtit. (Parus major). | Arbutus Unedo. |
| Marshtits (Parus biarmicus, pendulinus). | Calamagrostis, Arundo and Phragmites. |
| Wrens (Regulus ignicapillus, cristatus). | Juniperus oxycedrus. |
| Accentor alpinus and modularis. | Briars. |
| Doves (Columba palumbus). | Leguminosæ and oaks. |
| Quail (Coturnix. sp. sp.) | Phytolacca decandra. |

Several curious examples of this method of disseminating seed are quoted. From the Botanical Garden at Palermo the small bulbs of *Oxalis cernua* were unearthed by birds and in a short time sown in all the fields in the neighbourhood. Through the agency of wild pigeons, two oaks (*Q. Macedonica and Ægilops*) are now growing in certain localities of Sicily, and Sardinia.

Seeds swallowed by birds germinate easily after having been digested. In Sicily, where many quail are killed, it is the custom to remove the contents of their stomachs and plant them in pots by which means rare and foreign plants are often obtained.

# Imperial Forest School, Dehra Dun.

## THE ANNUAL PRIZE DAY.

The distribution of prizes and certificates to the successful students of the Imperial Forest School class of 1891-93 took place in the large drawing hall of the School at Dehra on the 29th March. Sir E. C. Buck, Kt., C. S. I., C. S., Secretary to the Government of India in the Revenue and Agricultural Department, presided at the distribution, and was supported by Mr. B. Ribbentrop, C. I. E, Inspector-General of Forests: Colonel Doveton, Mr. H. C. Hill, and Mr. E. P. Dansey, Conservators of Forests; Mr. J. S. Gamble, the Director of the School; Mr. A. Smythies, the Deputy Director; Mr. A. F. Gradon and Mr. C. G. Rogers, Instructors at the School; Mr. E. McA. Moir, Mr. N. Hearle, and Mr. A. P. Grenfell, Deputy Conservators, School Circle and Mr. J. L. Pigot, Assistant Inspector-General. Among the guests present were Colonel Strahan, R. E., of the G. T. Survey; Colonel Begbie, 2nd P. W. O. Gurkhas; Mr. W. N. Boutflower, Inspector of Schools, Agra Circle; Mr. W. H. Reynolds, Superintendent of Forest Surveys; Mr. E. Thurston, Reporter on Economic Products to the Government of India; Dr. Leather, Agricultural Chemist; Mr. Leslie Rogers, Major Commandant of the Dehra Dun Mounted Rifles; Mr. J. H. Ivens, Executive Engineer; and many other ladies and gentlemen, residents of Dehra and the neighbourhood.

The Imperial Forest School building was once the residence of the officer commanding the Sirmoor Battalion, previous to the occupation of the new cantonment to the west of Dehra. The house has been greatly enlarged and extended to meet the requirements of a training college for forest officers in India; it is now a pretentious mass of buildings, prettily situated in a large, well laid out garden, which is the constant care of the Director, and well repays the attention he bestows upon it. The Forestry course is spread over two years, four months each year being spent by the students at the school and seven months in camp; the junior students visiting the forests in the Siwaliks, and the seniors the forests of the Punjab and Central India, and preparing a project for the final examination. The walls of the drawing hall on the prize day were covered with well executed specimens of the work done by the students during their course—inspection houses, bridges, road surveys, &c.; and on the table were the prizes—microscopes, drawing instruments, and medals, having a well engraved picture of the school on the obverse, and the name of the winner on the reverse.

The proceedings at the distribution of prizes began with the report of the Director, Mr. J. S. Gamble, M. A., who said: "We

are here assembled to bid good-bye to the students of the class of '1891-93, who have successfully passed the school course; they now 'leave us with certificates and some with prizes. The two years 'during which the class has been here have been uneventful; 'there has been no change in the personnel of the staff, which means 'that work has been regular. I wish to convey my warmest 'acknowledgments to Mr. Smythies, the Deputy Director; Messrs. 'Gradon and Rogers, the Instructors; and to the rest of the school 'staff, for their ever ready help and assistance. I trust they will all 'accept my most cordial thanks. To the officers of the Circle, 'Messrs. Moir, Hearle, and Grenfell, my best thanks are also due, 'especially to Mr. Moir, whose strong sympathy with the School is 'well known, and whose invaluable assistance in our hill tour in 'Jaunsar has done so much to make it an interesting excursion and 'a pleasant outing. Nor must I forget to tender my thanks to 'Messrs. Duthie and Cotes for their help in lectures and examin-'ations on botany and zoology, nor Mr. Reynolds and Mr. Thurston 'for their help in examinations. The School now has 101 students, 'the largest number that has yet attended. Next rains we expect a 'still larger number, probably 120, a number beyond which we can 'hardly manage to go, consistent with our accommodation. Last 'year there were 80 candidates for admission; this year the number 'has been 150 to both classes. The results of the examinations are 'now known to you. There were 7 failures out of 45 students, which 'I regret, but I think the results were good. Like last year there 'have been no honours men, but I am sure the Inspector-General 'and the Board of Control will acknowledge that the results have 'been very satisfactory, and that the class now leaving us have 'distinguished themselves by their observations and attention to 'practical work. I here take the opportunity of impressing upon 'the junior class the necessity for observation, especially as they are 'now about to visit Jaunsar, one of the most interesting of the 'hill forest divisions in India.

'Last year, at the prize giving, the Inspector-General was 'kind enough to announce that he would give a prize for the best 'essay on practical forestry; that prize has been won by A. M. 'Sawyer, whom I congratulate; and the Government of India, in 'recognition of his excellent essay, have added a copy of the '*Dictionary of Economic Products*, the valuable work we owe to Sir 'Edward Buck, who has this year paid us the compliment of being 'present. The Deputy Director, Mr. Smythies' prize for practical 'work has been won by C. S. Rogers; that given by Mr. Gilbert 'Rogers, for the best notebook, by Dhanjishah Avasia. My own 'prize for the best drawing has been won by Ramnath Mukerjee, and 'Mr. Moir's prize for the best in forestry subjects by Hari Keshav 'Washikar. We are indebted to the kindness of two Conservators, 'Mr. Eardley Wilmot in Oudh, and Major Bingham in Burma, for 'prizes for entomological collections; they have been won by W. J.

'Lane-Ryan and C. E. Allen. The medals have been awarded by 'the Board of Control as follows :—

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| 'Sylviculture 1 ... | ... Hari Keshav Washikar. |
| ' „ 2 ... | ... C. S. Rogers. |
| 'Surveying ... | ... A. R. Myers. |
| 'Forest Engineering | ... C. S. Rogers. |
| 'Botany ... | ... R. Gajaraju Mudaliar. |
| 'Herbarium ... | ... Krishnaji Javadekar. |
| 'Forest Law ... | ... Hari Keshav Washikar. |
| 'Natural Science ... | ... Hari Keshav Washikar. |
| 'Mathematics ... | ... S. Ramaswamiah. |
| 'General Proficiency Lower 'Class ... | ... Sham Sundar. |

'Our best thanks are due to those gentlemen who so kindly 'presented prizes this year.

'The School is somewhat unfavourably placed with regard 'to outdoor exercises. We are only in Dehra for four months in 'the year, and those months of almost continued rain, which 'much interfere with cricket and football ; still we had some 'good matches, and were we able to play more with other 'intitutions, I feel sure the Dehra Forest School could produce 'teams that would earn laurels for themselves. The athletic 'sports held in October were very successful ; the chief 'winners were : Lane-Ryan, Cole, Langhorne, Ethirajulu Naidu, 'Legge, and Tweedie. At the Volunteer sports of the Dehra Dún 'Mounted Rifles, the School greatly distinguished itself, Lane-Ryan 'winning Colonel Harington's cup for the best sportsman, and other 'prizes being won by Rivett, Jackson, Ryan, Pierce and Tweedie. 'It was very gratifying that on his recent inspection of the corps, 'the inspecting General expressed himself so pleased with the turn-'out, and the evolutions carried out by the men. We owe very 'much to Major Leslie Rogers, Captain Armstrong, and Sergeants-'Major Ivens, Harris, and Allen for their interest in the School and 'its Volunteers. I am also pleased to think the Inspector-General 'and the Board of Control approved of the physical exercise drill of 'the native students ; the drill is irksome, but I am glad to recognise 'the improvement this year, and wish to thank Colonel Begbie, 2-2 'P. W. O. Gurkhas, for the help of the Havildars who supervised 'the drill. I regret the gymnasium is not yet built, but hope it will 'soon be finished, and wish to thank the Government of India for 'having sanctioned its construction, and giving the cost of the 'fittings. Our new quarters are now being built, and will be ready 'in July ; the new hospital will also be ready for use in July. In 'it our native doctor, who has worked excellently this year, will find 'himself comfortably provided with accommodation ; we shall now 'be able to house 80 students, so that it will not be necessary in 'future to rent as large a number of houses in the town. The health 'of the men has been good this year, especially in camp ; we were

'fortunate in being away from the station during the epidemic of 'cholera that visited Dehra after the breaking up of the Hardwar 'fair last March. With regard to discipline, I am glad to say the 'conduct of the students, especially of those of the senior year now 'leaving us, has been very good. I have nothing more to say, except 'to express to the students now leaving us, that they have my best 'wishes and those of the whole School Staff; we shall watch their 'careers with interest, and hope they will get on, and prove a credit 'to the Imperial Forest School."

Mr. Gamble's report was received with loud cheers, after which Mr. Ribbentrop, the Inspector-General of Forests, addressed the students as follows: "Passed students of the Dehra Forest School, —'There lie behind you two years of honest hard work to which 'you can always look back with a feeling of pride, and I trust of 'pleasure; you are now about to enter upon a practical career in a 'service the importance of which is constantly growing; I hope 'you will work in that service with the same zeal that has characteri- 'sed your studies at this school; if you do so, you will serve your 'country well. Good solid work in the forests will be demanded of 'you, for we expect you not only to justify the outlay that Govern- 'ment has incurred in your training, but to conclusively prove the 'advantages of a high technical training for the Forest Service. I 'am so impressed with the practical character of the education at 'at this school, a system that has gradually and steadily developed to 'its present degree of excellence, that I am sure you will be able to 'do all that is required of you in practical life, and will do it well. 'No complaint can be made that the character of the examination you 'have undergone was too stereotyped, or insufficiently searching, 'for it has been throughout the aim of the Board of Control to 'ascertain the range and accuracy of your practical knowledge; and 'in the oral tests if you have not replied to the questions in the form 'contained in your lecture notes or text-books, it has not necessarily 'been counted against you, and I think the Examiners have fully 'succeeded in eliminating cram from the knowledge which you 'carry away with you from this school. I hope you will manfully 'bear any work or hardship the Service may demand of you, and 'will in after life be always a credit to the Dehra Forest School. 'Let this always be your aim. My best wishes follow you. I hope 'the junior students will work in class and forest as well as those 'have done who are now leaving us, and will not leave their hard 'work to the last few months of their course. You should take a 'lesson from the oral examination of your seniors; these tests pierce 'the feeble armour of a crammed mind, for it is only by continuous 'application to all your subjects that you can satisfy the searching 'oral tests of the Board of Examiners.

'Mr. Gamble and Professors, I most heartily congratulate 'you on the success and development of this school. I feel con- 'vinced there is no school of technical education in or out of India 'where a more practical course of studies is followed. You will

'acknowledge, I am sure, that the Board of control has afforded 'much material assistance in this direction, for which the school is 'indebted to the originators of the Board, Sir Edward Buck and Mr. 'Hill. I must not omit to thank Major Leslie Rogers and the offi- 'cers of the Dehra Dun Mounted Rifles for the great interest they 'have taken in the Forest School members of the corps, and con- 'gratulate them on the achievement of results, the excellence of 'which has been admitted by competent authority. In conclusion, 'Ladies and Gentlemen, let me express how flattered we are at your 'kind attendance here to-day, and thank you for it, in the name of 'the Board of Control, the Professors, the students and myself."

After loud cheers, Sir Edward Buck presented the certificates to the 34 students of the upper class and 4 students of the lower class, and the various prizes. Of the 38 successful men, 10 were European, and 28 natives; Mr. C. S. Rogers, a private student, was first on the list, and holds the proud position of being the first Englishman that has headed the list for many years.

Sir Edward then addressed the students with the following remarks: "I have in the first place to express to Mr. Gamble and 'the Board of Forest Conservators here assembled, my thanks for the 'honour they have done me by requesting me to distribute the 'prizes gained by the successful students of the year. I am glad of 'the opportunity to make known, if it be not known already, the 'very great interest felt by the Government of India in the progress 'and success of the Dehra Forest School; an interest not only due 'to a desire that the School should in itself obtain the high level to 'which Mr. Gamble is bringing it but due to the fact that the 'school represents an important policy. That policy is that the 'natives of India should share to a much larger extent than 'heretofore in the executive administration of the country. The 'desire that this policy should receive the fullest possible effect is 'not only the desire of the people of India and the Government 'of India, but of the people of England. The wish of England 'found expression in the Public Service Commission, and it is partly 'in support of their recommendations, supported by those of the 'Inspector-General of Forests, and the higher officials of the Forest 'Department, that the school has during the last two years been 'developed, and placed in a more important position. Its staff of 'Professors has been increased, its class rooms and museum enlarged, 'the accommodation for students increased, and a strong Examining 'Board appointed each year, to test the qualifications of the candi- 'dates. I venture to hope that the development of the school has 'not ceased, and that Mr. Gamble will lead it to still higher levels. 'I need hardly remind those assembled here, especially the students, 'that those born and educated in the country cannot expect to take 'any prominent share in its administration unless they be fitted by 'education to fill the more responsible posts which will now, for

APPENDIX SERIES

OF

# THE INDIAN FORESTER.

# FIBRES
## USED FOR BRUSH-MAKING.

In this hand-book information as to the chief fibres which are used in India for brush-making has been brought together. The main object in issuing it is, however, to draw attention in England to the fibre (Kittul or Salopa) of **Caryota urens** with a view to the possibility of India becoming a source of supply.

### INTRODUCTORY.

In 1888 Messrs. J. Broadhead & Sons, Paint and Brush Manufacturers, sent to Madras from England an assortment of fibres used in brush-making, with a view to gaining information as to any fibres which could be found to compete with any or all of them, and at lower prices. The fibres comprised *Bass* or *Piassava, Kittul, Mexican fibre, Italian whisk, French whisk* and *Cocoanut fibre*, concerning which the following details were given:—

"*Bass*" or "*Piassava*"* fibre, which comes to this country from Brazil, is originally in very long lengths and of very varying strengths, and its value at present, as thus imported, is from 30 to 40 shillings per hundred-weight. The dressers of the article steam it, straighten it, combing out rough and refuse, and then cut it and tie it up into bundles (all in the bundle of one length). This is known as "dressed bass." The lengths required in our trade are 5, 5½, 6, 6½, 7, 7½, and 8 inches; also some from 11 to 16 inches for drawing purposes (scrubbing brushes, etc.). Its value dressed is now from 48 to 58 shillings per hundred-weight.

"The *stiffness* of the fibre is its principal merit; and, had it a greater power of resistance, it would command still higher prices.

"*Kittul fibre.*—The produce of the Kittul palm is used principally for drawing (scrubbing brushes), being bent double to get it inserted into the holes drilled for it. It must be very flexible, and, at the same time, durable. Its value drawn or drafted in lengths (running from 7 or 8 inches to 7 or 8 feet, although the brush-maker does not require it beyond 2 feet) is from 12 to 20 pence per pound, English, according to the length.

"The sample sent was 'oil dyed,' and in this state its value is about one-third less.

"*Mexican fibre.*—This fibre comes from Mexico, and its value, in bales, is from 27 to 32 shillings per hundred-weight. It is dressed or drawn into lengths varying from 8 to 30 inches, and its value is thus about 4½ pence per pound. It is used for 'drawing,' and, occasionally, also for mixing with bristles to imitate them and reduce their quality.

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* *Bass* or *Piassaba.*—"The produce of two distinct Palms, *viz.*, **Leopoldina Piassaba** from Para, and **Attalea funifera** from Bahia." (*Jackson, Commercial Botany of the Nineteenth Century.*)

"*Italian whisk* is used for 'setting' in carpet brooms, etc. Its value is about 4 pence per pound.

"*French whisk* comes to us in lengths of from 10 to 18 inches, and is worth from 8 pence to 16 pence per pound according to quality. It must be very tough (not brittle) for drawing principally.

(This article also comes from South America; but the South America samples are inferior in value to the European.)

"*Cocoanut fibre*, got by bruising the husks of the cocoanut, is also used in brush-making, but it is of lower value than any of the above, *viz.*:—

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| Rough (best English-made) . . . | 32*s.* per hundred-weight. |
| Drafted . . . . . | 5*d.* per pound." |

In a further letter, in November, 1890, communicated to the Madras Government through the Secretary of State, Mr. W. H. Broadhead urged the desirability of a search for a strong and tough fibre to take the place of the American "Piassava" or "Bass," which was stated to be, at that time, worth, in the rough state as imported from Bahia, £55 per ton, more or less according to the proportion of stiff fibre and the presence or absence of stones and dirt.

Mr. Broadhead suggested that, "should there be no native fibre to be found in India which could compete by taking the place of this valuable fibre for brush-making purposes, the tree that produces the fibre may very possibly be able to grow in India, and, if so, should be introduced there (either in the form of seed sown or plants put in); and, if these were looked after by the Board of Agriculture, the nucleus of a very lucrative trade would be formed, as the crop would find a very high price in our country, especially if stiff."

In 1888 the Ordnance Officer in charge of the Arsenal, Fort William, wrote to the Agri-Horticultural Society, Madras, stating that, when in Madras two years previously, he had obtained some Piassava fibre by sending coolies up the palms for it, and forwarded a sample for inspection. But, in reply, the Secretary of the Society stated that of the fibre-yielding plants enumerated in Vol. IV of Dr. Watt's *Dictionary of Economic Products*, the only one that produces fibre in quality to agree very nearly with the sample sent is **Caryota urens**.

The requirements of fibres for brush-making are stated by Mr. Thompson in a letter to the Collector of the Nilgiris, to be "stiffness and elasticity, *i.e.*, if held between the fingers the fibre or knot of fibres should stand upright, and, if bent or pressed down, should have the power of recovery. Sufficient strength and flexibility is needed to stand drawing into the brush body without breakage. In short, the more nearly fibre, whether coarse or fine, approaches bristles in these characteristics, the more valuable will it prove for the purpose in question."

By means of enquiries instituted by the Madras Board of Revenue information was obtained as to the fibres of the Kittul Palm (**Caryota urens**), Palmyra Palm (**Borassus flabelliformis**), *Cocoa-nut* (**Cocos nucifera**), Screw Pine (**Pandanus odoratissimus**), American Aloe (**Agave americana**), Wild Date (**Phœnix dactylifera**), and Chipurapullalu, Vinapullalu or "broomsticks" (**Aristida setacea**).

These fibres may, together with others, be conveniently discussed *seriatim*.

## KITTUL.

### (Caryota urens.)

The following extract is taken from the *Dictionary of the Economic Products of India*:—

"**Habitat.**—A beautiful palm with smooth, annulated stem, met with in

the forests of the Western and Eastern moist zones. On the Western Ghâts it extends to near Mahableshwar. In the Settlement Reports of the Chanda district it is stated that this palm abounds in the south-eastern corner of Aheree, and might, with advantage, be extended to all parts of the district, for it thrives well wherever it is planted. It is common in Burma, Bengal, and Orissa, ascending in Sikkim to 5,000 feet.

"Fibre.—The leaves give the *kittul* fibre, which is very strong, and is made into ropes, brooms, baskets, and other articles. The fibre from the sheathing petiole is made into ropes and fishing-lines" (*Gamble*), and is said to be suitable for paper manufacture.

"At the Colonial and Indian Exhibition (1886-87) much interest was taken in *Salopa* fibre sent from Orissa, Burma, and Kolaba in Bombay. A corset manufacturer applied at the office of the Indian section for a fibre, which might take the place of whalebone in corset-making. He was shown the *salopa* (*kittul*) fibre, and also the similar cord-like fibre from the interior of the stems of the cocoanut and palmyra palms. It was suggested that, if either of these were to be sown in bands into the fabric of the corset, the desired object would be obtained. The idea met with approval, and within a few days the manufacturer exhibited a sample, and expressed the utmost confidence that, if he could procure a continuous supply of the fibre, a large trade might be done. He was referred to the Commissioner of the Ceylon Court, since a considerable trade was being done with that colony in its *kittul* fibre. Shortly after, however, he returned with the report that, while the *kittul* fibre was perhaps preferable for the brush-maker, the softer nature of the *salopa* fibre of India made it preferable for his purpose. These facts are alluded to in the hope of awakening interest in an Indian fibre that has been much neglected. For a good few years past Ceylon has done a by no means inconsiderable trade in *kittul* fibre, but no person seems to have thought of India as a possible source of supply. Since its introduction into commerce in 1860 the uses of *kittul* have greatly extended; and there would, therefore, seem everything to justify the expectation that India might, with advantage, enter into competition with Ceylon. The *kittul*, or as it is called in Orissa the *salopa* fibre, is the cord-like vascular bundles which surround the base of the leaf-sheath. Mr. A. Robottom was the first to introduce *kittul* fibre to European commerce. That gentleman is reported in *Spons' Encyclopædia* to have stated that Indian is inferior to Ceylon *kittul*. At the Colonial and Indian Exhibition he pointed out a sample of the much inferior *kittul*-like fibre from **Arenga saccharifera*** as the *kittul* he had formerly seen as sent from India. He admitted that the sample of *salopa* shown him at the Exhibition was as good as any he had ever seen from Ceylon, and seemed confident that a large trade could be done in the Indian fibre.

"It is commonly reported that, in Ceylon, the black fibre from the leaf-stalks is manufactured into ropes which are of great strength and durability, being used for tying wild elephants. A woolly material found at the base of the leaves is sometimes used for caulking ships in Burma. In some parts of India the cord-like fibre from the stem of this and other palms is employed as a bow-string or as a fishing line. (*Royle, Fib. Plants.*)"

A writer to the *Madras Times* (November, 1891) pointed out that the best fibre in Ceylon is extracted from the leaf-stalk, and stated that "the *pinnæ* or side-stalks also afford a good but rather shorter material, and, if we are about to compete with Ceylon in the production of this fibre, we must not content ourselves with gathering the loose reticulations alone,

* The Sago palm of Malacca and the Malaya.

but proceed to extraction from the leaf-stalk. As this tree has a very large leaf indeed, the midrib or rachis being from 18 to 20 feet in length, it is obvious that a very long fibre can be obtained from it. In Ceylon the fibre is graded from 0 to 3, that is to say, there are four different grades of the fibre, and they are sold at different prices; 0, the longest, is from 8 to 9 feet in length, and fetches R45 per ton in Colombo; 3, the shortest, about 12 inches in length, can be had for R20. As we before stated, the fibre is prepared by a wild tribe of Kandyans, known as 'Rodyahs,' and is brought down by them in the rough to Colombo, where it is sorted into grades according to length, as length is the chief factor in the value of the article. All these points should be taken into consideration; and, if those interested in the production of this fibre will only learn the method of extraction from the leaf, it will be found that the trees all afford a most plentiful supply of excellent material; each leaf will give two or three pounds of it. The lower and stronger leaves alone should be taken, and at certain periods the lowest range of leaves on the trees turn downwards and present their points to the gatherer, and they are also then readily detachable from the parent stalk, and can be harvested with a minimum of trouble. They should be gathered before they dry on the tree. A very slight soaking is sufficient to remove the gummy portions, and the fibre can be readily separated by hand and comb. This can be easily seen in a dry leaf in which the gum, etc., has disappeared from natural causes; the remaining fibre is exposed in a skeleton form and demands no trouble for separation, and no machinery.. There is no reason why this fibre should not be collected in great abundance, and sold at very reasonable rates."

Mr. John R. Jackson in his *Commercial Botany of the Nineteenth Century*, 1890, says with reference to the trade in *kittul*: "When first imported the finer fibres were used for mixing with horse-hair for stuffing cushions. As the fibre is imported, it is of a dusky-brown colour; but after it arrives here (in England) it is cleaned, combed, and arranged in long straight fibres, after which it is steeped in linseed oil to make it more pliable; this also has the effect of darkening it, and it becomes indeed almost black. It is softer and more pliable than Piassaba, and can consequently be used either alone or mixed with bristles in making soft, long-handled brooms, which are extremely durable, and can be sold at about a third the price of ordinary hair-brooms. The use of kittul fibre is said to be spreading not only in this country, but also on the Continent."

A circular was sent, in the latter end of 1891, by the Officiating Reporter on Economic Products, to the Directors of Agriculture, and Forest Officers in various Provinces, asking for as full information as might be possible on the following points:—

(1) Whether **Caryota urens** is abundant.
(2) The estimated quantity of fibre that may be annually available for export.
(3) Whether the supply could be increased, if a profitable demand for it arose in England.
(4) The nearest seaport or railway station to which it could be sent, and the wholesale price per ton at which it could be landed there.
(5) The month in which the fibre could be gathered and exported.

The information acquired by means of this circular and the enquiries of the Madras Board of Revenue is embodied in the following *précis* of letters.

General McLeod, Inspector General, Ordnance Department, Madras, reported in 1891 that Kittul fibre has been largely used for the manufacture of horse-scrubbing and carriage-brushes by the Ordnance Department, but, though the tree is found in quantities on both the east and west coasts of the

peninsula, he was not able to procure a local supply, though he made every effort to do so. The fibre used at present in the Ordnance Department is all obtained from Ceylon, where it is an article of considerable export. There is no reason whatever that it should not be obtained in this country, if a little enterprise were brought to bear on its production, as it is easily extracted and without destruction of the tree.

General McLeod's successor has reported, more recently, that the manufacture of kittul horse-brushes is being discontinued, as officers commanding mounted corps in the Madras Presidency have condemned the brushes after a lengthy trial. There seems no doubt that fibre suitable for brush-making could be obtained, but it apparently requires special selection and treatment.

From the Collector of Vizagapatam, Madras:— Vizagapatam District.

*Bastard Sago Palm.*—Its collection in Vizagapatam is altogether a question of price. Isolated trees are to be found everywhere, and they are decidedly numerous in parts of the Pottanghi and Paderu taluks and on some of the slopes of the Ghats. The trees have, however, to be climbed to gather the fibre, and, as only a small quantity can be obtained from each, collection would not be remunerative unless the prices are fairly high. I would suggest that the market price should be ascertained, and I should be authorised to endeavour to collect a few hundred-weights of it at a little less than this rate. If this is done, I will ask the Maharajah of Vizianagram to allow the Manager of his coffee estate at Anantagiri to endeavour to arrange with the hill-people, who attend the weekly fair there in large numbers, regarding the collection of the quantity wanted. They bring large quantities of all sorts of hill produce to this fair, and would, I am sure, quickly take the matter up if they found it paid them.

The Collector of Vizagapatam has made over samples of fibre to the jailor, who is anxious to do what he can in the way of brush-making, and specimens will be furnished when he has acquired experience in dealing with the rough material.

Specimens of fibre were sent to the Inspector General of Ordnance, Madras, who wrote as follows with reference to them:—

The fibre sent is hardly what is required, one sample being much too coarse and the other too fine. For Kittul fibre No. 1 the rate now paid is R45 per cwt. delivered in Ceylon, but, unless it could be supplied at a more favourable rate, it would be hardly worth while changing the present source of supply. The requirements of this Department would be about ½ tons annually; but the Transport Department has taken up the use of Kittul fibre for grooming mules, and the Commissary-General is also anxious to obtain supplies of good fibre locally, so it is probable that the demand will increase as time goes on.

From Mr. P. Thompson, Coonoor Brush Factory, Nilgiris, Madras:— Coonoor Factory.

*Kittul.*—This is by far the best fibre for brush-making that has as yet come before me. It is flexible and, at the same time, has stiffness and elasticity. By grading or sorting it can be used for various classes of brushes. The coarsest; it appears to me, would be a substitute for Piassava for bass brooms, while the finer can be used for other descriptions of brushes. Although the palm grows freely on both the west and east coast of this Presidency and is used for toddy, no one has, as yet, collected the fibre in any quantity, and I have had, up to the present, to import my supplies from Ceylon. It is there found to be a profitable article of export, and I would suggest that it might be worth while for Government to

institute inquiries of the authorities there as to the cultivation of the palm.

The following information was supplied, through the Collector of Malabar, Madras, regarding the *kittul* fibre procurable in that district :—

Malabar District.

## (*a*). NORTH MALABAR.

Roughly there are about 3,000 palms in the reserved forests and lands of this division, chiefly in the Kannoth and Periya ranges, but the trees are scattered all over the interior of the forests and not very accessible. Besides this, a great number of ryots have two to five palms near their houses, from which they extract toddy and get their fishing lines.

About a ton and-a-half of fibre can be collected from the trees in the reserve forests. It is difficult to estimate the quantity the ryots can produce, as they do not collect it for sale, nor are they skilful in doing it. The supply could be increased, as the palm is hardy and the seeds germinate freely.

The nearest seaport and railway station are Tellicherry and Nanjengod (in Mysore), respectively. As the Natives are quite unaccustomed to the work, at present a ton of fibre will cost about R2,250 at Tellicherry and R2,260 at Nanjengod.*

The fibre could be gathered at any time, but most conveniently from October to May. The ryots say that the fibre can be collected from trees 15 years and older, that the life of the palm is about 50 years, and that on an average two leaves with their sheathing petiole can be cut in a year, and that each leaf-sheath will yield about half to three-quarters of a pound of fibre.

## (*b*). SOUTH MALABAR.

There are 100,000 trees more or less in this division. Excepting Calicut taluk the Tahsildars put down the number as 85,100.

Four leaves can be annually cut from a palm without causing any injury, and, taking $\frac{1}{16}$lb of fibre as the outturn from a leaf, there will be an annual produce of 25,000lb of fibre, or about 11 tons.

When a good price is given the people of Malabar will take themselves to the cultivation of **Caryota** as ardently as any other, and in course of time (a decade is ample) a very large quantity of Kittul fibre can be annually exported and a large trade done.

**Caryota urens** is grown everywhere, but it grows best in red soil. Not less than 400 can be planted in an acre, and the first leaf can be cut and fibre taken when it is about 8 to 10 years old. It may live for 25 to 30 years when left alone, but when leaves are cut annually, as it will have to be cut for taking out fibre, it will not last more than 20 years, and each palm will therefore be serviceable from 10 to 12 years only. It is best to collect black fibre, as the leaves are immature when the fibre is white, and the cutting of immature leaves will be injurious to the palm, and it dies away sooner.

Samples of fibres from Malabar were forwarded to the Inspector General of Ordnance, Madras, who reported that the sample from Kottayam taluk appeared to be a good one, and that the other samples were unsuited for Ordnance Department requirements, though it was thought that those labelled "Ernád" and "Walawanád" might be much improved by dressing and selection.

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* It may be assumed that the cost of collection of the fibre would be considerably diminished with an increase in the demand for it and with systematic collection.

*Abstract of information regarding Kittul fibre that may be gathered in the district of Malabar.*

| Taluk. | Number of palms producing fibre in each taluk. | Estimated quantity of fibre available for export in a year. | Whether the supply could be increased, if a demand for it arises. | The nearest seaport or railway station to which it could be sent, and the wholesale price per ton at which it could be landed there, as reported by the Tahsildars and District Forest-officers. | The month in which the fibre can be gathered and exported. | Remarks. |
|---|---|---|---|---|---|---|
| | | lb | | | | |
| 1. Chirakkal | 1,000 | 1,000 | No, because people are averse to cultivate it, as the cultivation of cocoa-nut, etc., is more profitable. | Port Cannanore, ₹3,360 | Can be gathered in October, and exported in December. | |
| 2. Kóttayam | 450 | 60 | Do. do. | Port Tellicherry, ₹4,480 | Can be gathered in March and April, and exported in April and May. | The Tahsildars of Wynaad, Ernád and Walawanád report that three kinds of fibre can be gathered. Ponani Tahsildar reports that two kinds of fibre can be gathered. Pálghat Tahsildar reports that no fibre can be gathered in that taluk. |
| 3. Kurumbranád | 3,050 | 500 | Do. do. | Ports Badagara and Quilandi, ₹2,240. | Can be gathered and exported in April, May. | |
| 4. Wynaad | 12,500 | 6,300 | Yes, if a reasonable price is obtained. | Ports Tellicherry and Calicut, and railway station Calicut, ₹1,400. | Can be gathered in January and February, and exported in March and April. | |
| 5. Calicut | 12,000 | 600 | Do. do. | Railway stations Ferok and Calicut, and port Calicut, ₹1,500 to ₹2,240. | Can be gathered in December and January, and exported in April. | |
| 6. Ernád | 20,000 | 2,000 | Do. do. | Railway station Ferok, Parpanangadi and Tirur, ₹300 to ₹600 for black fibre, and double the price for white fibre. | Can be gathered and exported from November to May. | |
| 7. Walawanád | 25,000 | 6,250 | Do. do. | Railway stations Pattambi, Ottapalam and Lakkadi, ₹300. | Can be gathered and exported from December to May. | |
| 8. Ponáni | 40,000 | 2,000 | No, because palms are used for the more profitable trade of toddy drawing. | Port Ponáni; railway stations Tanur, Tirur, Edakulam, Kuttipuram and Pallipuram on the South-west line, ₹3,000. | Summer season. | |
| 9. Pálghat | 100 | ... | ..... | ..... | ..... | |
| 10. Reserve Forest, North Malabar. | 3,000 | 2,240 | Yes | Port Tellichery and Nanjengod in Mysore, ₹2,260. | Can be gathered and exported from October to May. | |

Godávari District.

From the Collector of Godávari District, Madras:—

**Caryota urens** is found on the Rekapalle hills, but is believed to grow more freely in Rampa, which tract, however, has never yet been visited by a Forest officer. The quantity of fibre that may be annually available for export is estimated at 1000lb or, perhaps, more. The District Forest officer is of opinion that much greater quantities may be procured from the Rekapalle range, and says that the best and greatest quantity is extracted from the leaf-stalk. The supply could, probably, be increased if more attention were paid to it, and the trees reserved. Coconada is the nearest sea-port to which the fibre could be sent. The fibre may be gathered and exported during any season of the year.

Ganjam.

The Collector of Ganjam reported that **Caryota urens** grows freely in Gumsur, and, though at present restricted to situations near villages where it has been planted, its cultivation might be extended with ease, and suggested that experiments should be carried out with a view to determining the possibility of obtaining the fibre at a remunerative price.

The Khonds regard the palm with much affection, as it supplies them with their favourite beverage.

Coimbatore District.

The Collector of Coimbatore, Madras, reported that **Caryota urens** is not found in abundance in that district, but that it is abundant in the adjoining Cochin and Travancore Forest limits.

South Canara.

From the Collector of South Canara, Madras: —

The palm, which is locally known as "baini mara," is not abundant in South Canara. It is, however to be found in almost all parts of the district but in a scattered condition, and is not very abundant anywhere. It is essentially, like other palms and canes, a tree of the dense, moist, and evergreen parts of the forests, outside which it is seldom found except in gardens and groves, being, in fact, cultivated or, at least, favoured by the people. There is no trade in the district in the fibre, which is only extracted by individuals, as wanted, for fishing lines and for sewing leaf-caps, umbrellas, etc. The District Forest officer reports that the fibre can be got only when the tree begins to flower, as the sheath then becomes hard and brittle; that the removal of the leaves meanwhile is detrimental to the yield of toddy; and that only ¼lb of fibre can be got from one sheath, and that by a day's labour, so that the cost per ton amounts to about R1,680. If arrangements for its collection were made, the annual quantity that may be expected from the whole district may be roughly estimated at about a quarter of a ton. The District Forest officer considers that the supply could not be appreciably increased, even if a real trade in the fibre could be started, that nothing in the way of Forest cultivation is feasible, and that collection would tend to make the tree scarcer. In these views I concur under present circumstances; but, of course, in a district like this, well suited to the growth of the tree, the extent of its cultivation depends solely upon the demand for its produce and the price procurable for it. Should a demand for the fibre, rendering its cultivation profitable, spring up, doubtless the cultivation of it would rapidly extend.

The fibre can be sent down to all the sea-ports in the district, whence it can be transported to Bombay. Assuming the cost of collection to be R1,680 per ton, transport to the coast and freight to Bombay might possibly increase the cost by about 10 per cent., which would bring the price of a ton up to R1,848, or roughly R1,850 at that port.

The month in which the fibre could be gathered and exported is March.

Bengal.

From the Assistant Conservator of Forests, Kurseong Division, Bengal:—

The process of extraction of the fibre, as far as I can make out from a Ranger's report, is as follows:—

The outer skin is cut at the so-called knots, and taken off. This is then well pounded with a hammer (of wood probably). After that it is soaked in mud (under water) for two weeks, and, when the cells have rotted, the fibre is collected and used. They also use the thicker part of the stem, cutting it right through at the knots, splitting up the blocks, and proceeding as before.

The fibre is very seldom used in this district, and very few people know that the plant gives a fibre for cloth-making.

From the Deputy Conservator of Forests, Teesta Division, Bengal:—

The plant is, I believe, abundant in this division and occurs in most places, usually on the banks of rivers where the ground has not been cleared for cultivation. Seedlings of the trees are numerous, but, owing to the dense undergrowth of the forest, are not readily found. Big trees are scarce as, in all easily accessible places, they have been cut by Lepchas, who eat the pith as food. To attempt an estimate of the quantity annually available would be misleading. If a profitable demand arose for it, Mr. Lister, who has grown some trees, informs me that it can be easily grown from seed, and requires little or no attention. Some trees felled by him in 1884, which I saw at Nimbong, are 4'10" in girth and over 20' in height. He writes to me as follows: "Carriage is so expensive in the hills that we have little chance of competing with districts favoured with cheap water-carriage, and this palm seems to have a wide range from Nepal to Burma."

The nearest station at present is Silliguri, and the cost of carriage per ton would certainly not be less than R14.

I understand that the fibre is obtained from the sheaths. The most convenient time for collecting and exporting would be from October to June. During the rains work would have to be suspended entirely.

The Assistant Conservator of Forests, Angul Division, Bengal, reported that **Caryota urens** was once very abundant in that division, but that, during the late scarcity, the trees were all cut, and the pith used as food by the poor aborigines. As the matter stands at present, it is difficult to reckon on any appreciable supply of fibre being collected.

Bombay Presidency.

The following note on the occurrence of **Caryota urens** in the Bombay Presidency was supplied by the Director of Agriculture:—

The only part of the Presidency where **Caryota urens** is found in any abundance is the Southern Division of the Kanara District, the estimated productive area on the ghats being 228 square miles, exclusive of scattered patches in the east, the area of which is unknown. In the Northern Division of the district it grows in a few inaccessible places in the Supa and Karwar Talukas. It is also found scattered in groves in the moist evergreen forests of the Western Ghâts and Mâtheran. It is more common in the southern portions of this Presidency than north of the Kolhapur State. The Mokhada Petha of the Thâná District is said to be suited to the growth of this palm. The number of trees now found there is estimated at 500, but this the Conservator of Forests, Northern Circle, considers an under-estimate.

The palm does not grow in Sind.

Only well-grown mature trees give the proper quality of fibre: from old trees the fibre is brittle and difficult of extraction. The trees arrive at maturity in about 20 years, and can be stripped of leaves for the next five years, *i.e.*, till they begin to flower and are tapped for toddy; they then exhaust themselves and die in a few years. Only a very small portion of the fibre of each leaf is thick enough to answer trade purposes.

The leaves are cut and left to dry for one day, and the fibre is picked out by hand from the leaf-stalk. The Divisional Forest Officer, Southern Division, Kanara, states that during the five years of fibre production only two leaves can be stripped annually, each leaf yielding one ounce. He estimates that 1000 trees could be annually stripped, which will thus yield about one cwt. of fibre. According to the Forest Officer, Northern Division of Kanara, the palm produces yearly three new leaves, yielding about 4 ounces of fibre.

A second source of fibre is the fruit-stalk, obtained from trees not tapped for toddy. In Poona and Satára the stalks themselves are used instead of cocoanut twine for tying thatched roofs. In Poona a fibre is extracted from these fruit-stalks after they have been rotted in water for a month. About 1000lb of fibre, apparently in the form of fruit-stalks, can be collected in the Mokhada Petha of the Thána District.

The supply of fibre could be increased, but it would be at the expense of the Abkari Revenue, which is considerable. It is said that the yield in toddy would be diminished if the trees were stripped of their leaves. Last year tapping fee at the rate of R3 per tree was collected on 4,175 trees in the Sirsi and Siddapur ranges in Kanara.

In the Mokhada Petha of Thána the number of trees could be considerably increased by sowing and plantations in the course of a few years.

Kumpta and Honaver are the nearest seaport towns for the export of the produce of the Southern Division of Kanara. The wholesale approximate price per ton at which the fibre could be delivered on the spot is R2,240, being calculated experimentally thus:—

| | R | a. | p. |
|---|---|---|---|
| Wages of a man to climb six trees for twelve leaves for 12 ounces of fibre | 0 | 4 | 0 |
| Wages of two men to separate the fibre from the leaves | 0 | 8 | 0 |
| TOTAL | 0 | 12 | 0 |

Thus 12 oz. of fibre cost 12 annas and a ton R2,240. To this will have to be added the charge of conveyance to the ports of shipment, say, R11 per ton. The fruit-stalks produced in the Mokhada Petha of Thána can be delivered at the Kasara Station on the Great Indian Peninsula Railway line at probably an average charge of R20 per ton.

April is said to be the proper time for gathering the fibre in Kanara, while in Thána the fruit-stalks can be gathered in November and December.

**Burma.**

From the Conservator of Forests, Pegu Circle, Burma:—

**Caryota urens** is fairly abundant in the Zeyawadi range of the Toungoo Division, and east of the Sittang river in the Shwegyin Division. In all the other divisions it is very scarce.

In Toungoo it is considered that 2,000lb might be obtained, but it is believed that stripping the trees would kill them, and that no annual supply could be expected. From Shwegyin it is reported that no estimate can be framed as, although the tree is plentiful in the localities named, its fibre is never extracted for sale.

The supply could, no doubt, be increased if a demand for it arose which was profitable enough to induce the people to plant trees. The fibre, if extracted, would be sent to Rangoon. It is almost impossible to estimate the cost of delivery. It would probably be not less than R150 per ton, which is about the cost of Sterculia fibre.

The fibre could be gathered and exported from November to March.

The following report was received from the Deputy Conservator of Forests, Upper Burma:—

There are two kinds of **Caryota urens** in this division, known by the Burmans as *Minbaw gyi* and *Chouk minbaw*.

*Minbaw gyi* is large, and the leaves are in proportion. The fibre is

much coarser than that yielded by *Chouk minbaw*, and is not at all prized by the Burmans. It is not very plentiful.

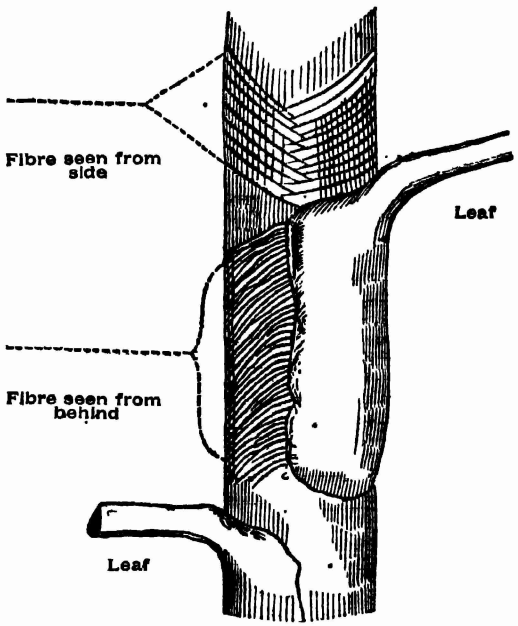
*Chouk minbaw* produces a very good fibre, which is used to a certain extent by the Burmans for making ropes for well buckets, as it does not easily rot. The tree is fairly plentiful in the division, and is spread over the whole division to a greater or less extent. The Burmans and Shâns do not use the fibre to any great extent, and any attempt to get it produced for export would have to start *ab initio*, and would be a new industry entirely. At present the method of obtaining it is very wasteful. The tree is cut down, and a few of the leaves are used. The prices that would have to be paid are very high. For the separated fibre R1 to R1-4 per viss would have to be paid to enable the workers to earn 8 annas per day. If the dried leaves were collected and exported, the price would be much less. A supply would no doubt be forthcoming if there was a regular demand for it at remunerative prices. It could be brought to Mandalay at present and later on to Katha and stations along the Mu Valley State Railway line.

## CEYLON KITTUL.

Ceylon.

The following note is taken from a recent communication from the Colonial Secretary, Ceylon, to the Madras Government :—

The Kittul tree is generally most prized for its sugar and toddy-yielding qualities in Ceylon. The collection of the fibre is, as a rule, delayed until the tree has flowered and begun to yield sugar and toddy. In places where the fibre is collected from young trees three or four years old, the fibre sometimes commands a higher price in the market, but the tree is ruined.



The process of removing the fibre is as follows: The fibre collector takes a sharp knife and climbs up the tree till he reaches the base of the "crown" and there selects a leaf that affords a sufficient hold or footing from which to commence operations. The fibre in itself forms a strong, connecting tissue by which the base of the leaf-stalk of the palm is held to the tree, much after the manner shown in the annexed sketch, and in order to support the leaf is closely folded upon the body of the plant long before the leaf itself is fully formed. The operator introduces the point of his knife under the fibre midway between the two edges of leaf-stalk and severs the tissue, pulling the leaf as he does so outwardly and downwards till it detaches itself from the tree. After removing as many leaves as will yield mature fibre, the operator descends and proceeds to cut the fibre off the leaf-stalk, and the whole is then picked over by hand and combed till it is free of any woody or other foreign matter, and finally put off into bundles each about 2 feet long and 4 inches wide, tapering at both ends into a point. The quantity of fibre depends greatly on the age or size of the tree. In a young tree that has not flowered, the largest quantity appears to be present, and is said to be as much as 4lb when clean; but again, in very young trees, not more than 6 feet in height, a greater quantity can be obtained by taking all the fibre round each stalk-base till the heart or "cabbage" is reached, but the *quality* is inferior and the plant is killed. In this way the collectors of Kittul fibre (Kenddi) kill a large number of palms yearly, to the great loss of the "Wahampuriyo" (toddy and jaggery-makers) who depend on the Kittul to afford them a means of living.

The price paid by traders in Kittul is said to be from R9 to R12 per cwt.

## AMERICAN ALOE.

### (Agave americana.)

Habitat.—Originally a native of America; naturalised in many parts of India. Extensively used for hedges to protect railways.

Mr. Thompson recorded his opinion that the fibres of various varieties of *Agave* are all more adapted for weaving than for brush-making, not being so good even as coir. In his brush factory on the Nilgiris Aloe fibre, prepared from **Agave americana**, purchased in the Coimbatore bazar, is used.

Lieutenant-General H. McLeod reported that he believes *Mexican* to be the fibre of the American Aloe (**Agave americana**) which grows plentifully everywhere, especially along the railway lines, and that he used this fibre twenty-five years ago to mix with hog bristles in making horse-brushes to reduce the cost of the brushes.

In an article on brush-making fibres of India (*Indian Agriculturist*, December 12th, 1891) it is stated that "Mexican is produced in South America from the American Aloe (**Agave americana**), and is very largely used in brush-making. It is a white lustrous fibre, strong, elastic, and durable, and is used alone to make white brushes, and, in combination with bristles, to make the white lines that are seen in many brushes; and again, dyed black, it is used with bristles mixed in the tufts to reduce the cost of brush-making, as it is very much less costly than bristles are, the best hog bristles fetching as much as 7*s.* 6*d.* per pound in the London market. This is the quality known as 'lily,' and is a white lustrous bristle, while its imitator, the 'Mexican'

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*. Mexican fibre or Istle is the fibre of **Agave heteracantha**.
Mexican whisk or Broom-root is the fibre of **Epicampes macroura**.

fibre, does not cost more than £20 or £25 per ton, that is, 2 to 3 pence per pound. Prices, however, of this fibre are also rising, and a good quality of it will probably fetch £30 per ton. This fibre should be very easily procurable in India, as the American Aloe grows everywhere, and has been used already for fine fibre. But, as now we want a stout fibre approaching, as much as possible, to the texture and quality of hog bristle, the methods previously used for the extraction of weaving fibre from this plant would probably not be successful in producing a good brush material. The most mature leaves should be selected for treatment, and it is very probable that the tall flower stalk would also yield a very valuable material, as it would be much longer in staple, and length is a very important factor in regulating the value of brush-making fibres. There is a good deal of gummy matter, which would have to be removed if the fibre was meant for weaving, but which is much better left where it is to a large extent, if the fibre is intended for brush-making purposes, as the gum lends stiffness and elasticity to the fibre—qualities that are much desired in this connection. It is obvious, therefore, that maceration in water should be avoided in this treatment, and some such process as drying the leaves and beating them dry is much more likely to produce a good stiff fibre. Of course a comb would be required to remove ragged ends and superfluous matter; but, if these fibres are carefully prepared and bundled in lengths, there is but little doubt that either or both of them might successfully compete with Mexican on the London market."

The Calcutta brush-makers import Mexican fibre (called in the vernacular *reju*) from England, and say that the fibre of **A. americana** has not sufficient glaze to be as useful as Mexican.

## PALMYRA PALM.

**(Borassus flabelliformis.)**

**Habitat.**—Cultivated throughout tropical India, and beyond the tropics in Bengal and the southern part of the North-West Provinces.

Lieutenant-General H. McLeod reported that "an excellent substitute for piasaba is used by the Ordnance Department, in this (Madras) Presidency, which is obtained from the Palmyra palm. It is, in my opinion, quite equal to Brazilian piasaba, and can be obtained in the lengths mentioned by Mr. Broadhead. The Superintendent, Gun Carriage Factory, would be able to supply samples and prices."

A writer to the *Madras Times* (November, 1891), says that a very good fibre can be extracted from the leaf-stalk of the Cocoa palm and Palmyra palms, not so long but quite as strong as the Brazilian piasaba, and if carefully extracted in its extreme length, sorted in bundles, and dyed brown the colour of piasaba, would certainly fetch a good price in the London market.

In January, 1892, the Inspector-General of Ordnance, Madras, reported that the Palmyra fibre, used at the Gun Carriage Factory, Madras, in lieu of piasaba, was obtained by local purchase at the rate of R1 per lb, and was found to answer. Sometimes it has been received so flexible as to be unsuitable, and, at other times, brittle, but fibre of this nature has always been rejected. Piasaba brushes for guns of large calibre have been made, and found suitable.

The Deputy Collector of Madras reported that Palmyra fibre is brought into Madras from the Chingleput District, where the palm is very abundant. "The fibre is received in a very rough state, and requires considerable treatment before it is fit for use. He also stated that he understood

that the Palmyra fibre used for brush-making is imported from Ceylon, as the fibre produced locally is not suited for the purpose.

The following information relative to the preparation of Palmyra fibre as carried out in the Salem District, Madras, was supplied by the District Forest Officer:—

The fibre is obtained from the stalks of the leaves, which are usually taken from the tree soon after the toddy-drawing season. The leaf-stalks, when in a green state, are beaten with a wooden mallet on a flat granite slab. The surface or outer fibres are then separated, and reserved for making strong ropes. The inner fibres, well separated from the non-fibrous tissue by being rubbed between the hands, are combed with a wooden comb or beaten on the ground, and are then ready to be worked up into ropes or to be used in the raw state for binding the roofs of thatched houses. It appears that the maximum yield of leaves from one tree in a year is ten, and that the ten leaf-stalks will produce about 1 lb of fibre, which it would take a man or woman a whole day to prepare. Thus the average yield of fibre per tree per annum may be set down at from ½ to ¼ of a pound. This, however, is not a district like Tanjore and Tinnevelly in which Palmyras are numerous. Doubtless if a foreign demand for the fibre was to spring up at a price somewhat higher than the local cost of production, which is about 2½ annas per lb, a considerable quantity might be available for export.

Palmyra fibre is exported to Ceylon from Pámban, a town on Rámésvaram Island in the Madura District, Madras.

The following information as to the trade in, and method of preparation of, the fibre was obtained from a report by the Head Assistant Collector of the Madura District:—

Pámban is the only place in this division in which the trade is carried on at all. Its existence there seems to be largely due to the efforts of the agent of a firm in Colombo who has been actually engaged in encouraging the natives of the island to prepare and sell to him the fibre. It is with great difficulty that he can induce the people to undertake an industry that is new to them and was not practised by their forefathers, and in many instances instruction in the method of preparing the fibre and even advances of money to be repaid in fibre were not productive of much extension of the trade. Were it not for this difficulty, the quantity available in this division would be very large, as Palmyra trees grow in great numbers in every part of it. This might, however, be surmounted if instruction as to the method of preparation of the fibre and information as to the high price it fetches were sufficiently disseminated. The present price in Pámban Island is Rs 10 a hundredweight.

The method of preparation simply consists in detaching from the trunk of the Palmyra tree the lower part of the stalk of the leaf which remains clinging to the tree after the leaf has been cut off or died, beating this with a wooden hammer, and pulling out the fibre which is so detached. The best trees for the purpose are young ones from 12 to 15 feet high, as in these there are usually more of these leaf-stalks attached to the trunk. They fall off as the tree gets older. The stalks require to be of a certain and particular state of decay, in which the fibre in them when hammered out will be of a black colour. The white fibre which is obtained from immature stalks is less pliable and more brittle, and fetches an inferior price in the market.

As explained above, the quantity which would be available in this division depends less upon the number of palmyra trees here than upon the

extent to which the people could be induced to undertake the industry. Palmyras abound everywhere along the coast, and were sufficient hands available the supply would be very considerable, but at present, and for these reasons, no more definite information can be given than that 158 cwts. have been exported from Pámban alone since April in this year, and that the industry there is still a new one capable of improvement.

In a letter from Messrs. Ide and Christie, June, 1892, to Mr. D. Morris of the Royal Gardens, Kew, it is stated that the first arrivals of this fibre took place about a year ago, the scarcity and high values of Brazilian Piassava having induced the production and shipment of substitutes. The early imports realized from 36*l.* to 42*l.* per ton, against West Coast African Piassava 55*l.* to 65*l.*, but with fuller supplies of these brush-making fibres (including split bamboo) market values have receded, and Palmyra ranges to-day from 22*l.* to 33*l.*

The chief objection to Palmyra by manufacturers is that it lacks straightness, but experiments are being made in this country to overcome this defect, and should they prove successful it is claimed by importers and dressers that Palmyra should, for wear then, be found equal to the best Brazilian.

## SCREW-PINE.

### (Pandanus odoratissimus.)

**Habitat.**—Frequently planted on account of the fragrancy of its flowers, but wild on the coasts of South India, Burma and the Andamans. Found abundantly in Bengal and Madras.

The Superintendent of the Madras School of Arts reported that the aerial roots are commonly used by painters and white-washers.

It has been suggested (*Indian Agriculturist*, December 12th, 1891) as probable that a very good substitute for Mexican might be extracted from the aerial roots of this pine, which grows in great profusion on all the backwaters of the west coast, and is stated that these roots are habitually used by the natives as whitewashing or *chunaming* brushes. The only simple process they put them through is to cut off a piece of the root of the length they want for a brush, and bruise out the fibre at an end to the extent of two or three inches, and the brush is at once ready to hand. The remarks made with reference to the retention of the gummy matter in the case of **Agave americana** apply also to the fibre of the Screw-pine.

## COCOA-NUT.

**Habitat.**—Cultivated throughout tropical India and Burma, especially near the sea coast. On the eastern and western coasts it is more particularly abundant, more so towards the south.

Mr. Thompson, Coonoor, reported as follows:—

"I have used this to some extent, and it is, as I know, used in England to a considerable extent for ordinary household brushes. It requires to be selected with some care, as only the stiffer fibres are suited for brush-making. These could, I think, be taken, and the rest of the fibre still be equally good for the ordinary use of coir.

"Cocoa-nut fibre should, it is said, be selected, well carded from both ends, and the stoutest and longest fibres bundled together. Mr. Brougham, in the note already referred to, states that it requires to be carefully manipulated and sorted. Frequent washing and beating greatly

improve the quality of the fibre, and under this process it appears to attain a certain amount of elasticity."

The District Forest Officer of South Arcot in the Madras Presidency reported that any quantity of prepared fibre can be obtained from Cuddalore by giving prior notice to the manufacturers, who are chiefly women of the fisher caste living along the coast. The price of a pound of prepared coir is nine pies and of fibre about six pies. The method of preparing the fibre is described as follows: The fibrous rind which thickly covers the unripe cocoanut is separated in segments of halves and quarters and steeped in pits of salt-water along the low-tide mark of the back waters, and left there to rot for about a fortnight, after which it is taken out and beaten with a wooden mallet until a greater portion of the pithy husk adhering to the fibre is separated. It is then well washed and dried so as to be fit for conversion into ropes, brushes, etc.

In the *Scientific American*, August, 1892, in a note on the manufacture of brushes from coir on Rhode Island it is stated that the best fibre is obtained from some of the islands grown on the coast, while that produced by the trees on the main land, for the lack of salt water apparently, is much inferior, and many devices are designed by the natives to make this fibre simulate that of the island, so that they may obtain a corresponding price in the market.

## CHUSAN PALM.

### (Chamærops fortunei.)*

Attention is called in the *Indian Agriculturist*, December 12th, 1891, to the value of the fibre of this palm, which has been successfully introduced on the Nilgiris, for brush-making. "It grows," the writer says, "to a height of 10 to 15 feet, and the whole of the trunk from the ground up is clothed with a thick mass of fibre, which can be easily removed by hand, and only needs to be combed out and bundled in lengths to be a most valuable article. It is a plant that would pay well to cultivate, as it gives off an immense quantity of fibre for the mere trouble of gathering. It is admirably adapted for cultivation on the Nilgiris or other hills of Southern India."

Mr. M. A. Lawson, Government Botanist, Madras, reported that C. fortunei could be grown to almost any extent on the Nilgiri hills, and most profitably at elevations ranging from four to six thousand feet; that it is of slow growth, and that the amount of fibre yielded by each tree is somewhat small.

## WILD DATE.

### (Phœnix sylvestris.)

**Habitat.**—Indigenous in many parts of India, being most abundant in Bengal, Behar, on the Coromandel Coast, and in Guzerat. It also forms extensive forests in Rohilkhand, on the low ground along the Ramganga river, and on the plateau of Mysore between Shimoga and Tumkur. It is

* The fibre of **Chamærops humilis**, the European Fan Palm, is dried in the natural colour, or dyed black to resemble horse-hair, as a substitute for which it is used in upholstery (*Jackson. op. cit*).

not uncommon in the Siwalik. tract and outer Himálaya, attaining an altitude of 5,000 feet in Kumaon. It is also commonly cultivated and self-sown in most parts of India and Ceylon, except in Sind and the South-Western Punjab, where P. **dactylifera** takes its place.

Mr. P. Thompson reported that this is used in the Nílgiri district for whitewashing and similar purposes, and that he has tried it for sweeping brushes. "It is," he says, "a fairly good stiff fibre, but when dry is somewhat brittle, which, of course, largely detracts from its value. It is possible that some different mode of treatment may improve it."

## MUNJ.

### (Saccharum ciliare.)

**Habitat.**—A tall handsome grass, 8 to 12 feet high, abundant over the greater part of North-West India, where, especially in the Panjáb, it covers large tracts of country, It is sometimes also planted in lines as a boundary hedge, more particularly in low-lying localities subject to periodical inundation.

In his recent Monograph* on fibrous manufactures in the Panjáb, Mr. W. H. Gee, District Judge of Dera Ghazi Khan, refers to brushes and moulds for metal wares made from MUNJ, weavers' brushes of MUNJ and KHAS, and brushes ("Juri") of bággar grass.

As regards MUNJ Mr. Gee writes as follows:—

"*Munj.*—Of the **Saccharum** family there are at least three species common in nearly every district, *viz.*, **Saccharum munja**, the true *munj*, the sheaths and spathe of which are especially valuable for rope making; the **Saccharum Sara**, known as sarkanda or kána, the largest reed of the three, used chiefly in chick and screen-making; the **Saccharum spontaneum**, kánh or káhi, used occasionally for ropes, but generally for chicks and thatching, the stem also forming the material for pens.

"The MUNJ and its varieties are undoubtedly the commonest and most useful of all our fibrous products. The rapidity of its reproduction, the strength of its fibres, and the ease with which it is collected and worked up all combine to render it indispensable to the zamindár. It is to be found on low damp ground near lakes and rivers, and a sandy soil is favourable to its growth. The only district in which it is actually cultivated is Jhelum, where 60 acres are annually planted with bulbs in the rainy season.

"The plant matures after two years, and then an annual supply of munj can be obtained from it. It shoots in the spring, and is cut in autumn. The bundles are then stacked until the slack season arrives, when the villagers extract the fibres by beating the sheaths with a wooden mallet, five sérs of munj being an average day's work. The thick ends of the sheaths are sometimes burnt first in order to render the separation of the fibres easier. Only the sheaths of the three upper joints of the stem are used for munj making, those below being too coarse for the purpose. In Mooltan the owner of the land generally employs labourers to cut the plant, he taking one quarter and they three quarters of the amount cut. If paid in cash they get 4 annas a day.

The different parts of the plant are known as follows:—

*Sar* or *sarkara*, the coarse leaves at the base, only used for thatching purposes.

*Kána* or *sarkanda*, the knotted stem when stripped of the munj.

* Lahore *Civil and Military Gazette* Press, 1891.

*Munj*, the sheaths and spathes of the stem.
*Tíli*, the finer part of the stem without knots.
*Sirka* or *sirki*, the tapering flower stalk.

"From the munj is made the well-known bán munj, universally used for stringing charpoys and ropes of all kinds. . . . Brushes and moulds for metal wares are also made out of the fibre.

"The outturn of munj is 6,000 maunds in Gurgáon, ₹10,000 worth in Delhi, ₹8,750 worth in Hissár, ₹15,000 in Hoshiárpur, ₹10,000 in Lahore, ₹10,000 in Siálkot, ₹4,860 in Muzuffargarh. The average price is 20 sérs a rupee, it being cheapest in Jullundur and Ferozepur, where the price is close on 30 sérs per rupee."

At the Forest School, Dehra Dun, coarse dusting brushes are made from munj purchased locally in the bazar.

## BROOMSTICK GRASS.

(Aristida setacea)

**Habitat.**—Common in dry parts of the Panjáb and North West Provinces; also in South India, where it grows in dry, barren, binding soil.

In the Selections from the Records of the Madras Government (No. XXIII, 1856, Reports on the fibres of Southern India) reference is made to teasing brushes from Kimedi made from the roots of a grass called chípuruvalellu. These are likely to command a ready sale if they could be brought prominently into notice.

The following information with reference to *vínapullalu, chípurapullalu* and *pahasa usa vellu* was obtained by the recent enquiries of the Madras Revenue Board:—

From the Collector of Nellore District, Madras:—

The term "Pazaha usa vellu" is unknown in this district; but, on instituting enquiries how weaver's brushes are made, it is found that the roots of broomsticks ("vinapullalu" or "chípurapullalu") are dug out of the ground by Yerukalas (wandering gangs) between October and March, and sold to weavers at rates varying from 12 to 4 annas a viss. These roots are available in all parts of the district.

From the Collector, Cuddapah District, Madras:—

The roots of *Pazaha usa vellu* can be obtained from forest tracts and waste lands in the taluks of Ráyachóti, Váyalpád and Kadiri of the sub-division, and Pullampet and Badvél taluks of the main division, but in quantities sufficient for sale and continuously. They are not even of such quality as to be useful for weaver's brushes. The weavers in this district purchase what they require from the Yerikalus (a wandering tribe), who bring the roots from the Nellore district and from Kalastri and Venkatagiri divisions.

Samples of chípurapullalu roots and brushes made therefrom were sent to the Madras Board of Revenue by the Collector of Ganjam, who reported that they can be obtained from Parlakemidi extensively in the rainy and cold seasons, but not in the hot weather, raw roots costing between 3 and 4 annas a viss. He further noted that the roots can be obtained in the Berhampore taluk also.

In a note on fibres for brush-making Mr. Brougham, District Forest Officer, Nellore, states that "*Vínapullalu* is in request among weavers,

who make brushes from the roots which, in sandy soils, attain at length of from 2 to 3 feet and, in hard soil, about 15 inches. The texture differs markedly according to soil. In loose sandy soil skirting the coast, the root fibre attains a greater length, and is less bristly. In laterite soil the fibre is coarse and stiff, but scarcely flexible enough for good brushes."

The weaver's brushes of the west coast are reported (*Indian Agriculturist*, December 12th, 1891) to be made of this grass, which, it is said, would be a very fair substitute for whisk.

## CUSCUS, KHUS-KHUS OR KOOSA.

**(Andropogon muricatus.)**

**Habitat.**—A perennial, tufted grass, very common in every part of the coast (Coromandel, Mysore) and in Bengal and Burma, where it meets with a low moist, rich soil, especially on the banks of water-courses, etc. (*Roxb.*). It covers large tracts of waste lands in Cuttack. It inhabits the plains of the Panjáb and North-West Provinces, and ascends into Kumaon, 1,000 to 2,000 feet in altitude.(*Duthie*). Cultivated in Rájputana and Chutia Nagpur (Gobindpur).

The roots (*khas*) of this grass are stated by Mr. W. H. Gee in his monograph on fibrous manufactures in the Panjáb to be used for the manufacture of weaver's brushes.

The grass is reported as growing locally in the Panjáb, but as being not found within 80 miles north of Multan. The price of *khas* is given as being ₹5 per maund at Lahore, and ₹6 to ₹8 per maund at Dera Ismail Khan.

## BHABAR GRASS.

**(Ischæmum angustifolium.)**

This species is described, in the *Dictionary of the Economic Products of India*, as being a perennial grass, plentiful in the Sub-Himálayan tract as well as in the hilly parts of Bundelkhand and Central India. It is frequently found associated with **Eriophorum comosum** (*Bubar*), and hence proceeded an error, only recently corrected, of viewing both as one and the same. **Eriophorum** is a sedge and **Ischæmum** a grass, but both are no doubt employed for the same purposes.

In his monograph on fibrous manufactures in the Panjáb, Mr. W. H. Gee records brushes (*Jurri*) as being made by the Bhanjrás, a low caste of Hindus, at Nálagarh and Náhan, and quotes the price of the grass as being 12 seers a rupee at Simla, where brushes are sold in the bazár.

In the North-West Provinces this grass is used in the manufacture of small brooms for sweeping houses, etc., which are sold in all villages of the forests at the rate of four or five brooms to the anna.

## PIONEER ARMY BRUSH FACTORY.

This Factory, in which bristles are mainly used, is now in full swing at Cawnpore. The manufactures comprise hair brushes, clothes brushes, horse brushes, blacking brushes, etc. The excellence of the material, cheapness, and superiority of the brushes in comparison with those previously supplied to Government by bazár brush-makers have been testified to, and it is to be hoped that the Factory will hold its own against imported European goods of a similar class.

## BRUSHES SENT TO THE IMPERIAL INSTITUTE.

| Fibre. | Place of manufacture. | Use. | Price. | | |
|---|---|---|---|---|---|
| | | | *R* | *a.* | *p.* |
| Aloe * | Calcutta | Painting | 0 | 8 | 0 |
| | Ditto | Mill brush | 0 | 6 | 0 |
| | Ditto | Carpet brush | 0 | 6 | 0 |
| | Ditto | Horse brush | 0 | 10 | 0 |
| | Ditto | Clothes brush | 0 | 6 | 0 |
| | Ditto | Wheel brush | 0 | 6 | 0 |
| | Ditto | Carpet brush | 0 | 10 | 0 |
| | Cawnpore | Horse brush | 0 | 9 | 0 |
| | Ditto | Carpet brush | 0 | 5 | 0 |
| | Ditto | Ditto | 0 | 6 | 0 |
| | Ditto | Boot brush | 0 | 6 | 0 |
| Cocoa-nut (coir) | Bombay | Collecting flour from sides of hand mill | 0 | 4 | 0 |
| | Calcutta | Floor cleaning | 0 | 7 | 0 |
| Roots of Cynodon dactylon (Couch grass) | Poona | Sizing wool fair even (used for blankets) | 2 | 0 | 0 |
| | Ditto | Used in manufacture of cotton cloth | 2 | 4 to 3 | 0 8 0 |
| Horse-hair | Bombay | Painting | 0 | 1 | 0 |
| | Ditto | Ditto | 0 | 0 | 6 |
| | Calcutta | Shoe brush | 0 | 5 | 0 |
| | Ditto | Clothes brush | 0 | 6 | 0 |
| | Ditto | Ditto | 0 | 4 | 0 |
| | Ditto | Cleaning cloth on loom | 0 | 6 | 0 |
| | Ditto | Carpet brush | 0 | 7 | 0 |
| | Cawnpore | Clothes brush | 0 | 6 | 0 |
| | Ditto | Boot brush | 0 | 3 | 0 |
| | Ditto | Ditto | 0 | 4 | 0 |
| | Ditto | Horse brush | 0 | 6 | 0 |
| Horse-hair and Aloe. | Ditto | Boot brush | 0 | 6 | 0 |
| | Calcutta | Clothes brush | 0 | 5 | 0 |
| | Cawnpore | Ditto | 0 | 6 | 0 |
| | Ditto | Cleaning brass buckles, etc. | 0 | 6 | 0 |
| | Calcutta | Wall brush | 1 | 0 | 0 |
| Pig bristle | Bombay | Cleaning gold and silver ornaments | 0 | 4 | 0 |
| Aloe * | Calcutta | Scrubbing brush | 0 | 13 | 0 |
| | Ditto | White-washing brush | 0 | 10 | 0 |
| | Ditto | Chimney brush | 0 | 4 | 0 |
| | Ditto | Nail brush | 0 | 4 | 0 |
| Aloe and horse-hair. | Ditto | White-washing brush | 0 | 8 | 0 |
| Andropogon, sp. | Ditto | Cloth brush | 1 | 4 | 0 |
| Caryota urens (Kittul). | Ditto | Horse brush made from fibre steeped in mustard oil and unsteeped | 0 | 12 and 0 | 0 0 |

* Mexican, *vide* p. 11.

| Fibre. | Place of manufacture. | Use | Price. R a. p. |
|---|---|---|---|
| Cocoanut | Calcutta | Scrubbing brush | 0 13 6 |
| | Ditto | Deck brush, large | 0 3 6 |
| | Ditto | Ditto small | 0 1 0 |
| | Ditto | Furniture brush | 0 4 0 |
| Horse hair | Ditto | Stove brush | 0 14 0 |
| | Ditto | Indigo brush | 0 6 0 |
| | Ditto | Shoe brush | 0 8 0 |
| Jute | Ditto | White-washing brush | 0 8 0 |
| Palmyra | Ditto | Broom | 1 8 0 |
| Pig bristle and horse-hair. | Ditto | Hair brush | 1 0 0 |
| | Ditto | Ditto | 0 13 0 |
| Saccharum ciliare (Munj) | Dehra Dun | Dusting brush | |
| Ischœmum angustifolium (Bhabar grass) | Ditto | Ditto | |
| Andropogon muricatus (Khas) | Panjáb | Weaver's brush | 2 0 0 |
| Kittul (undressed. Lettering in coir). | Coonoor Brush Factory | Horse brush | 0 14 0 |
| Kittul (oil dressed). | Ditto | Ditto | 0 14 0 |
| Kittul (undressed Polished back) | Ditto | Ditto | 1 4 0 |
| Kittul (edged with horse-hair). | Ditto | Clothes brush | 0 12 0 |
| Kittul | Ditto | Hair brush | 0 8 0 |
| Ditto | Ditto | Scrubbing brush | 1 2 0 |
| Kittul and bristle | Ditto | Ditto | 0 14 0 |
| Bristle | Ditto | Horse brush | 1 4 0 |
| Cocoanut (coir) | Madras | Grooming cattle | 0 1 6 |
| Ditto | Ditto | White-washing | 0 8 0 |
| Cocoanut (spadix) | Ditto | Ditto | |
| Aerial roots of Pandanus odoratissimus (Screw Pine) | Ditto | Ditto | 0 0 2 |
| Ditto | Chingleput District, Madras. | | |
| Roots of Aristida setacea (broom-stick). | Madras | Weaver's brush | 4 8 0 |
| Ditto | Ditto | Ditto | 0 2 0 |

EDGAR THURSTON,
*Offg. Reporter on Economic Products to the Government of India.*

## II—CORRESPONDENCE.

### Manchuria Tiger Skins.

SIR,

The Tiger Skins with long hair referred in "E. D.'s" letter in the last *Forester*,* came no doubt from Manchuria, or, as the shopman seems to have suggested, North China.

Captain St. John Richardson, in a miscellaneous note, which appeared in No. 2., Vol, VI, of *The Bombay Natural History Society's Journal*, mentions that he saw one of these tiger-skins from Manchuria, in Rowland Ward's shop, and that "it measured '13 feet 4 inches, and had deep fur more like the snow-leopard 'then any other animal I know." Messrs Rowland Ward also informed him that they had recently *purchased* one of these skins for £63.

HUNTINGDON.

*NOTE.—February No.

HON. ED.

### The Departmental Blazer.

SIR,

A proposed pattern for a Blazer is in course of circulation among Bombay Foresters for the expression of their opinion. If if meets with sufficient approval here, it will be passed on to Dehra, and if necessary, to other provinces, for further criticism. Undersigned could not make anything satisfactory out of paper and paint-box, and the samples of cloth procured were only enough for one small pattern. Sketch of pattern is enclosed, with a bit of cloth of the ground color. The two small strips are only approximations to those actually chosen.

VELLEDA.

The pattern sent is that of wavy tree—like lines of dark green on a lighter ground. We confess that we do not much like it. We have also received from Burma specimen of a pattern which has apparently been adopted there, of two broad alternate stripes of light and dark green. This pattern is good and we prefer it to the other.

HON. ED.

# Potato Cultivation.

To the Editor of the Forester,

Sir

Anent your review of the Saharanpore Horticultural Gardens, regarding Potato experiments, it may interest youto know that much more extended experiments than those of Saharanpore, have been carried out at the Ramghur Tea and Fruit Gardens, and the Government Nursery, Moteswar. The Ramghur trials were made with forty-four varieties, and the Government Nursery trials with ten varieties, thus fifty-four kinds were experimented with, moreover the trials extended over three seasons, and on that account are of great value in forming a definite opinion. The potatoes were bought in 1890 for the most part, and no expense or trouble was spared to get together a really representative collection embracing good samples of all seasons and shapes. The collection came from four well-known seed firms in England, two of which are expert hybridizers and seedling raisers, and as a matter of fact contained the bulk of the varities sent by Messrs. Sutton & Sons to Saharanpore. The experiments came under my immediate supervision. The elevations of Moteswar and Ramghur range from six to eight thousand feet, and the trials were made in good virgin jungle soil. As in the Saharanpore trials, very variable results were obtained, interesting enough to the expert, but of little interest to the general reader, suffice it to say many of the kinds were apparently a failure, others were a partial success; several were promising, and one only a magnificent success, but this was put down to the fact that the tubers were all newly imported, and it was fairly argued no doubt that the second season would give different results. Unfortunately the firm from whom the Moteswar potatoes were obtained delayed despatching a month beyond the stipulated time on the ground that the weather was very bad at home. English firms do not sufficiently understand that a month behind hand at Bombay is a far more serious matter than a little bad weather in England. I mention this because the potatoes suffered very severely, however all were again tried the second season, the results were again very variable and I am bound to add vexing, as the promising varieties of the first year were amongst the worst failures, but the result of the second trial was that twenty four kinds were promptly condemned as not worth further trial. Coming to the third season, the balance of twenty kinds were again tried, and reduced to eight. Regarding the ten varieties at Moteswar, two only are worthy the name of a success, and those two unequally so. One is the well-known White Elephant and the other a so-called Australian Red Giant, I say so-called, because I imported the same kind under quite a different name. The up-shot of three years costly and disappointing experiments is that I have given up importing English potatoes, mainly on the ground that from a commercial point of view the game is ruinous, and by no means pays,

'the first time, be opened to them in the Forest, and other depart-
'ments. Those of the students who may have felt inclined to think
'the recent examination severe, must remember that 1893 is an
'epoch of considerable importance in the history of the Forest De-
'partment. Hitherto students trained at Dehra have ordinarily had
'no prospect of promotion to more than Rs. 100 or Rs. 200 per
'mensem at the end of their service. Under the new scheme presen-
'ted to the Secretary of State they will, if they do their duty, be able
'to rise to salaries of from Rs. 200 to Rs. 350 per mensem; and may,
'if they do exceptionally good service, obtain Rs. 600 per mensem
'before they take their pensions. With these enlarged prospects
'in, view, it has become the duty of the Government of India, to sup-
'port liberally the proposals made by Mr. Ribbentrop, Mr. Gamble,
'and their advisers, for the proper instruction of the Forest students;
'it only rests with you, students, to take full advantage of the op-
'portunities offered to you, in order to secure the further sympathy
'and encouragement of the Government, and to prove to your coun-
'trymen that a studentship of the Dehra School is a prize worth
'coveting.

'In one respect, independently of its value to the Forest
'Department, the school has proved, I venture to believe, a useful
'example to the rest of India. As Mr. Ribbentrop has remarked, it
'is a signal success as a technical school. I go a step further, and
'would say that it is a signal success as a practical School. What
'I mean is this. The student who passes through a technical school
'is usually fitted only for the technical profession which he is taught
'at the technical School. But the Dehra School teaching is of such
'a broad and useful character that I believe its students, that is, the
'students who pass out of it successfully, would be more fit for any
'kind of work requiring originality and practical treatment than the
'students of any School or College in India. It is the only impor-
'tant educational institution in India in which the student is taught
'more in the field and in the museum than in the lecture room; in
'fact in which he is taught how to observe, and how to draw con-
'clusions from observation. The consequence has been that the only
'signal instances which have, to my knowledge, occurred of original
'research leading to position and useful results being accomplished
'by natives of India, have been those in which such results have
'been produced by ex-students of the Dehra School. Only recently
'the Government of India has been obliged to close apprenticeships
'attached to the Geological Department, because natives of India
'could not be found qualified for original research. It is not that
'natives of India have not in them the necessary qualifications; it
'is, that the power lies unveloped in them; and has not been brought
'out by a training in habits of observation, such as you, students,
'fortunately obtain here. The only regret is that you were not
'taught these habits still earlier in life. but it is hoped that the

'reforms now being introduced in the educational system of many 'Provinces will remove this reproach ; and that the Forest student 'of Dehra, having been taught the habit of observation from early 'youth, will, as time goes on, not only take a lead in India, 'but will prove the equality of the native of India with the 'educated classes of all countries in scientific investigation and 'research.

'There is another direction, I am glad to say, in which Dehra 'has, in common with other institutions, given a strong lead ; that 'is, in games and gymnastics. I have had the pleasure and satis-'faction of seeing what the Dehra students, native as well as 'European, can do in this way. All I can say is that they 'can give points to many public schools in England. Well, 'the Forest Officer is of no use unless he can endure physical 'hardship and fatigue, and this is what games and gymnastics 'enable him to do. I intend to include Volunteering in this 'remark ; for it appears from the reports I have had that the Dehra 'Volunteers are among the best in India, and that they include in 'their number no less 30 students, who, by their constant atten-'dance at drill during the school season, have earned, it is said, the 'title of 'the nucleus of the corps.' For this result, Major Leslie 'Rogers and his officers deserve our gratitude.

'To return, in conclusion, to your more serious duties, I am 'glad to learn from Mr. Ribbentrop and Mr. Gamble that the stu-'dents have, on the whole, never done so well as they have this year. 'This is indeed encouraging, for, as it is here indicated, it is on the 'exertions of the students themselves, more perhaps than on the 'labours of their masters, that the future development of the school 'depends. Prove to the Government that the Dehra students 'deserve encouragement, and I can assure you that Government 'will in return do all it can to afford the support which Mr. 'Gamble's excellent management merit. To him, to his staff, 'and to the officers who have come from distant parts of India to 'take part in the examinations, our best thanks are due."

At the close of his speech Sir Edward Buck was cheered vociferously, and cheers were given with hearty good will for the Inspector-General of Forests, for the Board of Control, the Director, Deputy Director, the Instructors, and the ladies. The proceedings then terminated, and the meeting broke up.—*Pioneer.*

paying apart there are seveal well defined conclusions I have arrived at regarding the importation of potatoes. Firstly, indiscriminate importation is wholly wrong, and the Saharanpore trial is strong confirmatory evidence of this. Secondly, strictly limited importation is to be recommended, I mean the limitation more especially for varieties as distinguished from quantity—why, for instance, is "Windsor Castle" by far the best of those tried at Saharanpore? My answer is that this kind is a head and shoulders above a small army of other and older varieties. A still more striking example is to be found in the variety known as Magnum Bonum: when this kind was brought out by the very enterprising Messrs. Sutton & Sons, some fifteen years ago, it was the very Emperor of potatoes, and nothing in those days was anything like equal to it, alas to say it is down amongst the sickly diseased herd, a wreck in the old country. It is not too much to say that fully ninety-five per cent of all the potatoes grown in Kumaon and many other places in India are of this variety, and there are not wanting ample signs that this once splendid kind is coming to grief and nearly spent out. Now this is a very serious matter, because it means for Kumaon that with its failure will enevitably come the collapse of potato cultivation for the time being or until Government comes to the aid of the native cultivators with a new kind. Doubtless you are aware that the real potato disease has appeared in the Poona district, and that the study of the disease will no doubt be interesting. But it will not save a dying man, and the Doctors will find very heroic remedies necessary to prevent total collapse: and those who have to study this disease will do well to remember it is the leprosy of potato diseases, and nearly useless to waste money and time upon it. The true remedy is the English one, and I would beg leave to earnestly commend this to the attention of Government, for if we take England on its merits it is undoubtedly the best potato producing country in the world. Those who know French, German, Dutch, and American potatoes will, I am sure, bear me out in this, yet on the whole England is climatically one of the worst countries to be found for the potato, nearly every natural condition is against it, perhaps the best thing that can be said about it is, that it is temperate, of course cultivation is thorough, and the soil is good, and the best implements of culture are used, but these are more or less within the reach of all and do not count for England, any more than for any other place; the one natural advantage being a temperate climate, and I doubt of this being a very great advantage, an average of ten degrees more heat would be far better. Then why does the country produce the best potatoes, and hold its own against enormous odds and constantly recurring disease in its worst form? My explanation is, and I think it is the true and only one, that there is in England a body of systematic and zealous hybridisers and seedling raisers, and consequently new blood is ever flowing in, and ousting the weak sickly varieties. In short, evolution is in

very full force, and the weak go ruthlessly to the wall. Leaving out of account eminent Firms like Sutton & Sons, Carter & Co., Veitch & Sons, the Brothers A. & R. Dean, Fidler & Co., &c., a large number of the professional gardeners of the Country try their hand at raising a new potato and many succeed, and thus there is a constant string of new kinds, with all the vigour of new life in them: this is what I would try for India's deteriorating stock of potatoes. I believe I am open to be told this has been tried and failed; if so, why did it fail, and again where were the experiments tried; if on the plains, failure might well be written very large at the outset of any experiments with potatoes. But I see no reason why potatoes at an elevation of 5,000 feet and upwards should not seed freely and allow of hybridizing and thus the raising of new and vigorous kinds. It might be fairly argued that kinds so raised, would be likely to last longer then those raised at home as the conditions are more favourable. Finally, hybridising must be understood and carried out properly or the results are worse than useless. I doubt, too, if isolated efforts will or would lead to much, but a properly organized Government farm where the thing could be carried out properly under good supervision should not only be of the greatest benefit to the country but pay its way in time.

F. W. SEERS,

*Manager of the Ramghur Tea and Fruit Gardens, and Superintendent of the the Government Nursery, Kumaon, Moteswar.*

## III.—OFFICIAL PAPERS & INTELLIGENCE.

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# The Palmyra Palm.

The Inspector-General of Forests has recently sent the following Circular letter round to Conservators.

"I would feel much obliged if, in consultation with your 'Divisional Officers, you would furnish me with authentic informa-'tion regarding the occurrence of the Palmyra Palm *(Borassus 'flabelliformis)* in your Circle; and whether it is plentiful, common, 'or rare. It is stated that in some districts the fibre produced by 'this plant at the junction of its leaves is less developed than in 'others, while in some localities it is entirely wanting. This, I beg, 'may be specially noticed and recorded."

# Report on the effects of the late frosts on vegetation in Hongkong.

The unprecedented cold weather which the region about Hongkong was recently subjected to, calls for some notice to be taken of it, therefore I have the honour to submit a brief report which it may be considered useful to put on record. Records of experiences of meteorological phenomena such as we have just had, besides being of passing interest are so frequently of use in practical dealings with various subjects, that for this reason opportunities to record unusual phenomena should not be neglected. It does not, however, come within the province of this department to go much further into the meteorological aspects of the subject than is demanded in connection with its injurious effects on vegetation.

After a period of ordinary Hongkong dry, cool weather, rain fell on the 13th January and continued daily up to the 16th instant. In the Gardens, at 300 feet above sea level, the following quantities of rain were registered with a Glaisher's rain gauge :—

| | |
|---|---|
| January 14,..... | ·14 |
| „ 15,..... | ·35 |
| „ 16,..... | ·46 |
| „ 17,..... | ·45 |

On the 15th instant the temperature fell in the afternoon to 39° Fahrenheit, thermometer at 350 feet above sea level. On the 16th, at 9 A.M., it stood at 35°. On the 17th the thermometer stood at 31° at 9 A.M., which was the lowest temperature observed at the Gardens. During this period the sky was overcast except for a short time about noon on the 17th, but on the morning of the 18th it was clear and the sun shone brightly throughout the day, the temperature having risen to 43° at 4 P.M.

Unfortunately there are no official records of temperature at Victoria Peak, 1,818 feet above sea level, but, by such information as could be obtained from private observers in the hill district and observations made here, it seems that the temperature must have fallen at the summit to about 25° or 24° F.

On the river at Canton, and *en route* between this port and that place, low temperatures were recorded in the reports of the steam-ships *Powan* and *Honam*. They give—

January 16th at 1 A.M. 23° about 28 miles below Canton.
„ at 10 A.M. 26° about 85 miles from Hongkong.
„ „ at 1 P.M. 25° at Canton.
„ „ 18th at 10 A.M. 28° about 25 miles from Hongkong.

On the peninsula of Kowloon the cold appears to have been greater than in Hongkong, ice was seen on pools of water in the roads within 50 feet of sea level, and at the Kowloon Docks ice was observed at the bottom, 30 feet below sea level, of an empty dock.

Since the Observatory records began in 1884 the temperature has not fallen, until now, at the Observatory, below 40° F. I remember on one occasion, I think about 17 years ago, ice was found at Victoria Peak, but there is no record within me experience, which extends back nearly 22 years, when ice was observed below 1,700 feet altitude.

The continued low temperature combined with fall of rain from an apparently warmer stratum of air above resulted in the formation of ice varying in quantity from a thin coating on the upper leaves of pine trees growing at 300 feet above sea level to a thick encasement of perfectly transparent solid ice of 5½ inches in circumference on the blades and bents of grass at the summit of Victoria Peak. The grass bents themselves, which were the foundation on which the ice accumulated, were not more than an eighth of an inch in diameter, yet the formation of ice was so gradual that with the enormous accumulation of ice which became its own support, the bents retained their natural upright, or but slightly pendent position. These large accumulations of ice were on the windward side of the hill where rain drifted, but even on the lea side the average coating of ice was about 3 inches in circumference.

Evergreen shrubs and trees carried on their leaves solid coverings of ice ⅜ of an inch in thickness. The great weight of this ice caused the branches of trees to assume a pendent form, the strain in many cases causing the limbs to snap off with a crash. All vegetation throughout the hill regions of the Colony was thus covered with ice, as were also most other objects. Telegraph and telephone wires from Victoria Gap upwards were covered with ice ⅝ of an inch in thickness, and, in addition, carried icicles as much as 3 inches in length as close as they could be packed side by side. This caused many of the telephone wires to break, and the iron post at Victoria Gap which supported them was snapped off a few inches above the ground.

The windward sides of the walls of the look-out house at the Peak were from top to bottom covered with perfectly transparent ice ¾ of an inch in thickness.

All the hills on the mainland and Lantao Island were likewise white with ice, one of the hills (3,147 feet) of Lantao having what appeared to be snow for some few hundreds of feet down from its summit. As early as the evening of the 15th January, the summit of Taimoshan (about 3,300 feet) on the mainland had assumed a a whitish appearance, presumably from ice or snow.

The effect of the extremely low temperature on vegetation has been disastrous. The damages in the Gardens consist chiefly in the injury or destruction of leaves, but some plants are quite killed, these being natives of much warmer regions than Hongkong. Many of the decorative plants which were not killed will be months before they can regain their ornamental appearance.

Every possible precaution was adopted to minimise the effect of the cold. The plant-houses, which are provided with screens merely to produce shade, were all matted in and the roofs covered with straw. In spite of these precautions, however, many plants suffered very severely.

In the orchid-house, which was covered with mats and straw, all our best orchids have suffered very greatly, many being entirely killed while others were so much injured that, even if they survive, it may be some years before they regain their previous luxuriant state. A healthy plant, received from Calcutta several years ago, of *Dendrobium aggregatum*, is apparently killed, while plants of the same species growing by its side, and also others on trees where they had no shelter, which I collected 10 years ago on the Lo-fan mountains, about 60 miles from Canton, have escaped unharmed. This seems to show the capability of the plant in adapting itself to colder regions than it is generally found in. In ordinary winters the temperature is too low for many kinds of orchids and other tender plants.

The highest point of the Gardens is 320 feet above sea level, the lowest part 175 feet. Some plants of the same kinds which were damaged at the upper portions were uninjured at the lower parts of the gardens.

Of exotic trees planted on the hills *Albizzia Lebbek*, *Aleurites triloba* (candle-nut-tree) and *Eugenia Jambos* (the rose-apple-tree) had all their leaves killed at and upwards of 600 feet above sea level. Trees of the rose-apple at about 800 feet altitude have been entirely killed.

At 600 feet altitude indigenous plants began to be affected, the injuries increasing with higher altitude until at about 900 feet when the extreme limit of low temperature which some plants could bear was reached, and death ensued. Most of these are tropical plants of which Hongkong, Formosa, the Luchu Islands in the Far East, and the Sikkim Himalaya in India are the northern limits of the geographical area from whic they have been recorded. Of the plants killed or injured, *Ficus Harlandi*, Benth., *Gordonia anomala*, *Spreng.*, and *Garcinia oblongifolia*, *Champ.* are known only from Hongkong. Although many of our indigenous plants have not been yet discovered elsewhere, it is to be expected that when China is better known they will be found over a larger area than the restricted one of this island. The fact of the above named plants having succumbed to the late frost indicates that when they are discovered elsewhere they will be found southward of Hongkong.

Considerable damage to vegetation seems to have been caused about Canton where the alluvial lands are highly cultivated. The Reverend Dr. B. C. HENRY, in a letter dated 26th January, informs me that "The destruction of vegetation about Canton has been very great. The banana plantations "are ruined, and

the bamboos have suffered. The *Aleurites triloba* look all shrivelled up, while "*Begonias, Euphorbias, Crotons* and scores of others are simply destroyed." What Dr. HENRY reports indicates severer weather at Canton than here, as is proved by the reports of the steamers above referred to. *Aleurites triloba* leaves being shrivelled up at Canton, while they are here at 300 feet altitude uninjured, but at 600 feet here they are affected, and completely destroyed a little higher up the hill.

## IV.—REVIEWS.

# Annual Progress Report of State Forest Administration in New South Wales, for 1891.

Last October we noticed the Report for 1890, and now we have received that for the succeeding year. During 1891, various important steps were taken in the direction of re-organizing the department; two Inspecting Foresters were appointed who divide the colony between them, and the relieving Forester, alluded to in our last review, has also been appointed; the revenue is now received direct at the head Forest Office instead of at the Colonial Secretary's Office, the office staff has been strengthened, and some changes were made among the Foresters.

The area of Forest Reserves (1,013 in number) has apparently increased since the last report, being now 5,600,653 acres, or 7,815 square miles; the revenue was £18,455 and the expenditure, £23,875, shewing a deficit of £5,420, or rather more than last year. Both revenue and expenditure have increased each about £300, the latter being chiefly due to "the conservation of the red cedar 'upon the Northern Reserves, the thinning of the wattle at Otford 'and West Bargo, and the thinning and pruning of the valuable 'red gum saplings on the river Murray." It is expected that the returns in a few years will amply justify the outlay.

The following statement shews the result of forestry operations during the year:—

"The result of operations (the cost of which is included in a 'previous statement,) during the season on different reserves and 'plantations is very satisfactory. The total number of trees which 'have succeeded and are now making fair progress from the dif-'ferent systems adopted in thinning and planting, are as stated 'below.

| | | | |
|---|---|---|---|
| 'From planting | ... | ... Rs. | 16,450 |
| '„ distribution to School and public bodies | | „ | 75,000 |
| '„ thinning on the Murray (red-gum) | ... | „ | 2,000,000 |
| '„ „ on Don Dorigo (red cedar) | ... | „ | 7,000 |
| '„ „ at Otford and West Bargo (Wattles) | ... | „ | 128,000 |

'Total number of trees growing in plantations
'and on forest areas which have been oper-
'ated upon during the year under review ... „ 2,226,450

'Roughly speaking, the expense in connection with these oper-
'ations has not exceeded three-eights of a penny per tree.

'The botanical work of the department is noticed at some
'length, no less than eleven pages of the Report being devoted
'to specimens collected by various people, and seeds and timbers
'sent away. This detailed list would be more in place in an
'Appendix.

A notable feature in the Colony is Arbor Day, the account of which is as follows :—

"In 1890 an Arbor Day in connection with the Public
'Schools of the Colony was instituted by Mr. J. H. Carruthers,
'late Minister of Public Institution, and he decided that for the
'year 1891, the 21st of August be celebrated as a public holiday
'by the Schools for Arbor Day.

'At most of the Public Schools, Arbor Day was regarded as
'a holiday either on the particular day appointed or at a later date
'as circumstances permitted.

'Most of the trees supplied to the Schools were obtained from
'the Gosford State Nursery.

'Every endeavour was made by the Forest Department to
'execute the many orders which were received for trees and shrubs,
'and I think Arbor Day proved to be a pleasing and successful
'educational scheme. It brought parents, scholars and teachers
'together under agreeable circumstances, and opened up to youth-
'ful minds a fresh and almost unknown page in the natural history
'of the Colony.

'Some 4,000 catalogues of the trees for distribution, and also
'of the lecture upon Arboriculture, and the botanical drawings
'issued by the Forest Department were distributed by the Depart-
'ment of Public Instruction to the various Schools in the Colony.
'In many cases also both the lecture and the catalogues were
'distributed to the various corporate bodies in the Colony, to whom
'also trees at the Gosford Nursery were available.

'It is estimated that during the year something like 1,000,000
'trees and shrubs were given away by the Forest Department to
'Schools and corporate bodies in connection with Arbor Day and
'as exchanges for trees, plants, and seeds received.

'Last year there was some comment upon the smallness of
'some of the plants issued to schools and in a few cases there
'appeared to be a prejudice against small and young plants in
'favor of those of larger growth. No doubt in the first instance
'largely developed plants look much nicer, but they are not always
'so successful in maturing."

The number of plants of all sorts in the Gosford State Nursery is 1,225,709, a considerable increase since the previous year, the trees most numerously represented being *Eucalyptus corynocalyx*

and the sugar gum, and *Pinus insignis*, these two with *Ligustrum pubescens* forming numerically one half the total number of plants in the nursery, in which there are over 220 species altogether.

Section VIII of the report deals with the planting and thinning operations of the year. First we have red cedar which was planted out both from nurseries, and from the forest, where it was growing too thickly together and the result is reported as most successful. Then we have some interesting paragraphs about the struggle between the mining population of Broken Hill, and the pastoral and homestead lessees who complain that the edible shrubs they depend on for feeding sheep are cut down for fuel by the miners. Broken Hill is one of the richest silver mines in the world where the lead ore which is found with the silver alone pays all expenses thus leaving the whole of the silver as profit. Mr. EDNIE BROWN writes :—

" Broken Hill Mining Companies are a good deal interested ' in the source of wood fuel, and any drastic attempt to debar wood- ' getters from obtaining such timber as there is in the district would ' cause considerable inconvenience to some of the mines. At the ' same time there is the fact that wood for fuel for all purposes can ' be imported by rail into Broken Hill.

' On the other hand, the Department of Lands is largely ' interested in the preservation of Mulga, and all other edible trees ' in the district, as it is the mainstay of the pastoralists ; and in that ' droughty country, so frequently void of grass, the growth of the ' edible shrubs upon pastoral holdings is of grave consequence, and ' therefore any depletion of such trees and shrubs must depreciate ' the value of station properties.

' This very serious matter is receiving consideration at the hands ' of the department."

The thinning operations in the extensive forests of red gum on the Murray river are thus described :—

" The forest contains a very large number of self-grown seed- ' lings and saplings, and it has been found necessary owing to their ' thickness on the ground, with a view to the permanency of market- ' able timber, that they should be properly attended to in the way of ' thinning and pruning.

' A start in this direction was made in April 1891, the work ' being continued till the end of the following June, when it had ' to be given up for a time owing to the land being inundated.

' The operations, so far, have been conducted along the banks ' of the river in the counties of Cadell and Wakool.

' Some sixty men were employed upon the work, and the ' result was that some 3,500 acres of forest land were operated ' upon.

' The works were again commenced in November of last years ' and up to the date of this Report some 2,000 acres more or less, ' have been similarly operated upon.

'The work is still in progress, and about thirty men are 'employed in connection with it.

'The young trees are in all stages of growth, ranging in height 'from 2 feet and 3 feet to over 50 feet and 60 feet; and in all 'cases they are of a straight growth, almost branchless except at 'the top, healthy, and show every sign of eventually producing 'timber of a knotless and superior quality.

'Roughly stated, I may remark that the thinning operations 'have so far extended for about 12 miles of frontage along the 'Murray River.

'It is estimated that, taken as a whole, there have been 5,500 'acres operated upon in the manner described, and something like '350 healthy young trees have been left to the acre, thus showing 'that up to date about 2,000,000 of young trees have been treated 'and will remain as a standing crop to serve as a future timber 'supply."

We shall be interested in hearing the result of this thinning, in due course; it is estimated that in five to ten years time, there will be a large number of excellent piles available which are worth 15s. to 35s. each at the present day. The red gum is *Eucalyptus rostrata*, and this is what Mr. EDNIE BROWN writes about it:—

"It appears that the timber of the red gum (*Eucalyptus 'rostrata*) is held in very high repute in the Colony of Victoria, 'and is therefore preferred to any other class of timber in the 'construction of piers, wharves and bridges, and also for railway 'sleepers.

'In Melbourne, Sandridge, and Williamstown he (Mr. 'MANTON) reports having examined piles of red gum which had been 'over twenty-seven years in the ground and still perfectly sound. 'In a wharf at Echuca, constructed of red-gum timber twenty-five 'years ago, the girders and planking are yet quite sound. The 'same may be said of a wharf at Moama erected sixteen years ago.

'In the early days of the opening up of the Murray, boats of 'various kinds were constructed of red-gum from the Murray and 'adjoining forests, and many of these, although over twenty-five 'years old, are still in good condition.

'The department is in possession of a red-gum street paving 'block, obtained through the courtesy of Mr. MOUNTAIN, City 'Surveyor, Melbourne, which was taken out of the Flinders Street 'roadway near King street, Melbourne, after being there nearly 'eleven years—the street, after being laid with wood blocks, having 'been opened for traffic on the 9th April, 1881.

'Although this block was situated in a part subject to the 'heaviest traffic, the wear has only been about three quarters of an 'inch, and the wood of the block is perfectly sound.

'The block was taken up midway between the curbing and 'the tram rail, consequently it represents a fair average wear upon 'the roadway at that particular place."

It it evident that the Director-General is going the right way to work in endeavouring to conserve and improve these valuable forests which extend over 460,000 acres.

The last paragraphs of this section are devoted to Wattle conservation, in which the importance of the true wattle for tanning purposes is dwelt upon, the present arrangements for stripping the bark discussed, and the effects of thinning the natural wattle reserves, with proposals for future planting given.

In connection with the introduction of exotic trees, to produce timber of a lighter nature than the indigenous species—noticed in our last review, Mr. EDNIE BROWN states that he has about 243,000 plants available in the Gosford Nursery, and the specimens of American ash grown in South Australia have proved serviceable for staves of buggy wheels. As a beginning, he proposes to plant out small areas with pine, cypress, ash, oak or elm, as the circumstances of each district admit.

The Report closes with some interesting statistics regarding forest areas in various parts of the world, and of the timber trade in New South Wales. The usual list of Forest Reserves is given in the Appendix.

A. S.

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# Report on Canal Plantations, N.-W. P. for the year ending 31st. March, 1891.

This Report was not written till July, 1892, but the reason of this delay is nowhere explained. These plantations resemble in some points a small Forest Division, or large Range, with an area of 36,000 acres, and a net revenue of Rs. 86,000. The revenue was lower than that of the preceding year, owing to the completion of the Nadrai aqueduct, and other causes, while the expenditure was some Rs. 10,000 higher, owing to increased charges for sowing and planting and clearing jungle on canal banks capable of harbouring pigs.

The number of trees counted at the close of the year was 1,780,053, while 140,608 had been felled, the increase in the number counted being 8,790, so that felling did not diminish the stock of the total about 45,000 are over six feet on girth.

An interesting experiment is being carried on on the Upper Ganges Canal, where 4,000 seedlings of red gum (*Eucalyptus rostrata*) were planted out near Jawalapur, in order to see whether this tree will yield poles for the extensive head works above Hurdwar. For the temporary bunds alone they require 13,000 poles of various sizes every year, and it is believed that in ten years the red gum will yield sufficiently large poles for this purpose. From what we have seen in the Saharanpore Botanical Gardens there is no doubt that this will be the case. The difficulty is that the

canal authorities would have to plant, say, 15,000 seedlings every year, and then the carriage up stream for 10 to 17 miles, or even more, will prove expensive. At present, their supply of these poles is derived entirely from the forests of Dehra Dun—private or Government—and a special coppice area has been set aside in the Government forests near the Ganges, and is being treated as such, in order to yield in the future a regular supply of the smaller poles at any rate which are the most numerous. It will be interesting to observe whether the red gum on the Ganges Canal will furnish the same quality of timber as it does in New South Wales. If so, they have certainly planted the right stuff. For the temporary bunds, it does not much matter, as they are washed away every year, but for permanent spurs, the timber they put in should be durable.

"The Superintending Engineer reports that the experimental 'plantations of *Eucalyptus* (chiefly *rostrata* and *robusta*) in the 'Northern Division have been eminently successful so far. Of the '*rostrata* sown in October 1888, 130 trees came into the 3rd. 'class in the enumeration of March 1891. In the course of an- 'other year some idea may be formed as to whether these *Eucalypti* 'will furnish poles suitable for the Bhimgoda crib works. If they 'do, planting on a large scale will be undertaken.

It would be as well for the Canal authorities to calculate the *area* neecssary to produce the quantity of poles required every year: it would probably take at least 12 miles of Canal bank.

On the Agra Canal, grazing and lopping are stumbling blocks, as the following remarks shew:—

"The Superintending Engineer draws attention to the very 'great difficulty of maintaining any kind of fence at a reasonable 'cost, and points out that though a thorn fence made of Kikar 'thinnings, as suggested by the Inspecting Forest Officer, 'may be suitable for Forest tracts, yet without a large establish- 'ment to watch and patrol it, as compared with the area to be 'guarded in the long narrow strip of canal plantation, it would be 'impossible to prevent the fence itself from being carried away 'rapidly for fuel in the adjoining villages.

'The Superintending Engineer further points out that apart 'from the damage done by cattle grazing on young plantations, 'there is another cause of very serious damage to the young trees 'with which the Canal plantation establishment that can be employ- 'ed is quite unable to cope, *viz.* the wholesale lopping that goes on 'in order to obtain young shoots as food for goats and cattle. This 'is a well-known evil on this Canal. The Superintending Engineer 'suggests that the district authorities might he induced to help 'in this matter."

The net revenue of the canal plantations is a mere drop in the ocean compared to what they receive from irrigation, and a very large part of it might be devoted to making a permanent wire fence: wire netting for choice with iron standards; such a fence when once set up would be indestructable and absolutely efficient and it

would be a sound policy to devote Rs. 50,000 a year out of the net revenue, which can well afford it, until the whole system of canals is fenced from beginning to end. According to the figures in the Report, there are about 2,400 miles of boundary but much of this is said to be already fenced, though doubtless not in a permanent manner. Supposing it were necessary to fence half of this, it could probably all be done in 10 years.

A. S.

## Report of the Agricultural Department, Burma, for 1891-92.

This big Report, lately received, contains nothing much likely to be of special interest to Forest Officers, though it is remarkable as an evidence that good solid work is being done in the matter of revenue survey and assessment. The Report is illustrated by a series of district maps which we have found very interesting.

### V.—SHIKAR.

## The People's Tiger.

In the People's Park at Madras has lately been incarcerated a tiger which was captured in the forests of Tinnevelly by Mr. C. Dupré Thornton. The method employed was a cage made of palmyra rafters and iron bars, with a trap door, and a separate chamber which contained the bait—a goat. The following extract from the *Madras Times* will be interesting :—" Yesterday I paid ' him a visit. He knew his old master at once and rushed at the ' bars in a most affectionate way which I was accustomed to ; but ' the bystanders, who didn't know his tricks, fled in alarm. He ' is as savage and surly as ever. In the day he disdains to eat any ' meat, but at night he is forced to eat. His rations are 25 lbs. ' of meat a day, or about a goat and a half. The old keeper relates ' that he was very savage when first let in. He jumped with one ' bound to a window, near the ceiling, but the bars stood firm, and ' stripes was *sold*. For two or three days he bounded backwards and ' forwards in his new home, refusing to eat anything, and flying ' at the bars when anyone came near. It will require years of ' imprisonment to tame his proud spirit. He wants a mate very ' badly, as the tigress in the Zoo is old enough to be his grand- ' mother. Perhaps some of your readers may be able to catch a ' tigress in the same way as I caught the tiger, and send her up to ' Madras."

## Sport in Austro-Hungary.

The January number of the *Revue des Eaux et Forêts* after discussing the merits of smokeless powder for sporting purposes enumerates the bags made by various sportsmen during the past year in different parts of Austria. Without giving the details of these bags, many of which are enormous, we may quote the following which may interest some of our shikari readers. It is the official list of the game killed in Cis-Leithania only (and exclusive of Dalmatia) during the year 1890, 11,470 red-deer; 2,764 fallow deer ; 65,303 roe buck ; 7,038 chamois ; 2,640 boars ; 1,395,838 hares ; 83,687 rabbits ; 526 marmots ; 4,950 capercailzie ; 21,635 grouse ; 1,960 ptarmigan ; 3,524 rock partridges ; 152,796 pheasants ; 1,105,579 partridges ; 91,167 quail ; 42,450 woodcock ; 1,939 wild geese ; 49,590 wild duck ; 39 bears ; 136 wolves ; 32 lynxes ; 26,163 foxes ; 9,712 martins ; 25,877 weasels ; 1,150 otters ; 4,199 badgers ; 432 eagles ; 120,703 hawks and falcons ; 36,818 owls.

## VI.—EXTRACTS, NOTES AND QUERIES.

## Roadside Arboriculture in Bengal.

Mr. C. F. Worsley, Magistrate of Monghyr, has drawn up the following report regarding the system of planting trees followed by him, when he was in charge of the district of Mozufferpore, and the Government has directed that it be circulated to all district officers and district boards :—

"When I first commenced the system of planting trees along 'the sides of roads in Mozufferpore district in the year 1877, I 'adopted the plan which, I believe, is usually followed by inexpe- 'rienced amateur planters, of working through contractors, and 'allowing them to plant very young trees or to raise them from seed 'in the spots where the trees were intended to grow up. Each of 'these young trees or seedlings required to be protected by a gabion 'or bamboo fence, and it was soon discovered that the expenses of 'repairing or renewing the fences and of supplying water to the 'young trees in the hot season were more than the District Road 'Fund could conveniently bear. I accordingly tried the experiment 'of raising young trees in nurseries from seed sown either in pots or 'in the open ground, and of planting them out along the sides of 'roads when five or six feet high. It having been found in practice 'that the young trees so raised in pots succeeded best, this system 'was generally adopted in Mozufferpore from the year 1880.

In my report No. 99, dated 6th February, 1880, for the Road Cess year 1878-79 (published in pages 1471-1479 of Part II of the *Calcutta Gazette*, dated 29th September, 1880), I described at some length the operations of the Mozufferpore Road Committee in connection with the planting, and the subjoined extracts will explain the advantages of their system :—

"On all other roads the trees are fenced with strong bamboo gabions, six feet in height and two feet six inches in diameter, made on one uniform plan, and built round the tree when planted in the following manner :—

"Five whole, not split, bamboo posts eight feet in length and not less than one and-a-half inches in diameter, are sunk in the ground to a depth of two feet at equal distances from each other, and a radius of 15 inches from the stem of the tree. Four pieces of split bamboo are then placed between the posts, and split bamboos are woven in basket fashion to a height of six feet, the last six inches being passed through loops in the bamboo posts to prevent travellers removing and untwisting the basket-work, which was a common and very mischievous practice, and one that caused continual labour and considerable expense in repairs. I may add that the system now adopted has been absolutely successful in preventing such mischief and injury ; as, although easy to twist the split bamboos through the loops when green, it is most difficult to remove them when they have become dried and set.

*Nursery Gardens.*—Two nursery gardens have been established during the last Road Cess year 1878-79—one at the dak bungalow in Mozufferpore, the other in the District Engineer's grounds. The formation of nursery gardens was rendered necessary for several reasons, amongst them the following :—

"(1). The difficulty experienced in obtaining young fruit trees of even inferior description.

"(2). The policy of planting none but good varieties and descriptions of fruit trees, so as to ensure eventually from the sale of the fruit a handsome return for the outlay and expenditure incurred in planting and maintaining them.

"(3). To prevent injury in transplanting trees with tap roots such as *Artocarpus integrifolia*, *Bassia latifolia*, and *Dalbergia Sissoo* by raising them in pots, it having been found by practical experience most difficult to transplant such trees satisfactorily. Experience has impressed the necessity of using pots for all future nursery operations as being eventually a safer and more economical way of raising and transplanting young trees than in and from the open ground. After much care, time, and expense have been laid out and incurred on the young trees in the nurseries, it is very disappointing to find them dying a few days after being transplanted, in consequence of injury to tap roots, and here I would observe that it is very inadvisable to plant out any trees less than two years old. The cost of tending, watering, and maintaining them is much less in the nurseries than when they are scattered over many miles

of roads, and as the existence of a bamboo fence such as is used in this district is three to four years by the time it is worn out, its need is no longer required, the trees being five to six years old, and strong enough to do without such protection. We have now in the nurseries 14,112 well grown young trees, which will suffice for about 80 miles of road, which is about the annual average length of avenue planted in this district."

I may mention that the pots in which young trees are raised should be buried in shallow trenches, each trench being long and broad enough to hold 400 or 500 pots placed as close together as they will stand in parallel rows. The rims of the pots should be slightly below the level of the surrounding ground, so that they may all be easily and cheaply flushed with water every two or three days during the hot season from an adjacent well. Between the trenches there should be narrow raised pathways by which the gardeners may obtain access to the trees. It will be necessary as the trees advance in height to turn the pots occasionally; otherwise the roots are apt to strike through the pots and to penetrate the ground. It is best to prepare the trench of the required length and breadth in the first place, next to arrange the pots in rows therein, and then to fill up the spaces between the rows with earth. Where flower-pots are as cheap as they are in Mozufferpore, *viz.*, from Rs. 3 to Rs. 4 per 100, no hesitation should be felt about breaking each pot at the time of transplanting a young tree.

As regards the distance apart at which trees should be planted on roadside avenues, much depends on the kind of tree and on the locality. As a general rule, I would plant Pipul, Bur, and Rain-trees 50 feet, and all the others in the list from 30 to 40 feet.

If trees are not planted out by the sides of the roads until they are 5 or 6 feet high, and if they are planted out at the commencement of the rainy season, they will not require, in a climate like that of North Behar, to be watered in the following hot season. By that time their roots will have reached such a depth as to be able to dispense with artificial supplies of water, and nothing beyond general supervision and attention to the state of the gabions will be required. This duty can easily be performed by members of Road Committees, and the officers of their engineering departments. In drier parts of the country, it may be necessary to give water during the succeeding cold and hot season. And it may be advisable in very dry localities to adopt the plan of sinking a pot (kulsi) near the root of each plant, and keeping it filled with water at all times of drought during the first year or two after transplantation.

The holes in which the trees are to be planted by the roadside ought to be carefully prepared some months beforehand, and some old manure, where available, should be mixed with the earth. These holes should be at least 2½ feet wide and 2 feet deep, but if money be available, larger holes, say 4 feet in diameter and 3 feet

deep, are preferable. The height of the gabion* is of great importance. The two evils to be guarded against are (1) "the poisonous tooth,' as Virgil calls it, "of the accursed goat" which is certainly more injurious to the young tree than winter cold and summer heat, and (2) the mischievous habit which travellers have of breaking off the young shoots of the mango and some other kinds of trees and using them as tooth brushes. In places where white ants abound, it is a good plan to smear with tar the ends of the posts before fixing them in the ground, and a daub or two across other parts of the posts will deter villagers from extracting and appropriating them for their own use.

I would strongly recommend that avenues be planted with due regard to symmetry and convenience, and that large and small fruit-bearing and timber trees be not planted indiscriminately together. If it is intended eventually to sell the fruit of fruit-bearing trees year by year, it will be most convenient to plant a few miles of each road with each of the most valuable kinds of fruit trees *e. g.*, five miles with *Mangifera indica* five miles with *Artocarpus integrifolia*, five miles with *Bassia latifolia*, &c. This is the principle which I adopted in Mozufferpore town, where I planted about 12 miles of avenues with 12 different kinds of trees, fruit-bearing and timber, allowing one mile or so for each kind of tree.

The trees, which should specially be planted where the soil is suitable for their growth; are the following ;—

*Fruit trees.*

| Botanical name. | Native name. |
|---|---|
| Mangifera indica. | *Am.* |
| Eugenia Jambolana. | *Jamun.* |
| Aegle Marmelos. | *Bel.* |
| Bassia latifolia. | *Mohwa* |
| Artocarpus integrifolia. | *Jak* (or *Kantal.*) |

*Timber trees.*

| Botanical name. | Native name. |
|---|---|
| Swietenia ... Mahogani. / macrophylla. | *Mahogany.* / *Large-leaved Mahogany.* |
| Gmelina arborea. | *Kumbar* or *Gambar.* |
| Dalbergia Sissoo. | *Sissu.* |
| Cedrela Toona. | *Toon.* |
| Casuarina equisetifolia. | *Jhao.* |
| Pongamia glabra. | *Karanj.* |
| Albizzia Lebbek. | *Sirish.* |
| Pithecolobium Saman. | *Rain-tree.* |
| Lagerstræmia Reginæ. | *Jarul* |
| Pterospermum acerifolium. | *Kanuk Champa.* |
| Ficus ... religiosa. | *Pipal.* |
| Ficus ... bengalensis. | *Bur.* |

NOTE.—In the case of the two species of Ficus in the above list (Pipal and Bur) it is best not to plant seedlings but branches of adult trees. The branches selected should be straight, from four to eight feet long and from three to five inches in diameter.

* If a bamboo gabion is too expensive or inconvenient, a mound of earth topped with aloe leaves, or a ring of bricks placed alternately so as to admit light and air, where bricks are cheap, may be substituted.

When I left Mozufferpore district in December 1882, the total length of avenues on the district roads was about 210 miles, most of which were in very fair condition ; while along some 12 miles of roads in Mozufferpore town there were about 2,800 trees all of valuable kinds, which had been planted and maintained under my own immediate supervision at less than an average cost of Re. 1-8 per tree and most of which no longer required any special protection.—(*Indian Agriculturist.*)

## Forests in Russian Turkestan.

According to the February number of the *Geographical Journal*, Russian Turkestan is so poor in forests, and the existing woodlands have suffered so much of late from reckless cutting, that attempts are now being made to replant, partly in the mountains and partly in the Steppes. It is estimated that of the total area of Turkestan (162,000,000 acres), the territory has but 945,000 acres of forest land in the mountains, and nearly 16,000,000 acres of bushland in the Steppes. As to the plantations of trees which are met with in all native towns and villages, they cannot even satisfy the wants of the steadily increasing population for building purposes. The saxaul tree has been pitilessly exterminated all along the banks of the Syr Daria, and for a great distance around the centres of population, and, as natives say, "the saxaul has fled into the depth of the Steppes." The forests in the mountains were also recklessly cut down till the year 1879. At the same time, the whole of the region is, from some physical change, generally undergoing dessication. Both glaciers and rivers are decreasing ; the lakes dry up ; the extremes of temperature become more marked ; and the moving sands are increasing in area. The recent attempts at planting forest trees, without irrigation, which where made in the province of Samarcand in 1880, have proved quite successful ; so also the attempts made in the dry Steppe in the south of Samarcand, between the Shaar-sabiz Mountains and the Dargh Canal, where nearly 400 acres were planted. Since 1880 the system has been improved, the young trees being now planted on the slopes of the hills in terraces, which follow the contour lines. (*Pioneer.*)

## Old Dehra-Dunite News.

The Athletic sports of the Bengal Nagpur Railway Rifles, came off on the 2nd March at Nagpur when no less than five first prizes in addition to a special prize were won by Mr. J. P. Haslett, D. D. R., who is a Volunteer in the corps.

The prizes won by him were for the following events.
1st in the 100 yards flat race ;
" " " 120 " hurdle race ;
" " " ½ mile flat race ;
" " " 200 yards flat race ;
" " " three legged race with Mr. Middleton ;
And the special prize given by Colonel. Wynne for the best all round man at the sports.

Mr. Haslett was running in very good form and with a little more training would be an excellent runner.

P. H. C.

## Fellows of Coopers Hill.

We hear from England that the following old Coopers Hill Forest Students have been appointed 'Fellows of Coopers Hill., C. G. Rogers ; B. B. Osmaston ; H. H. Haines ; F. A. Leete ; S. Carr. We offer them our congratulations.

## Technical Education for Geologists and Foresters.

It is a noteworthy fact, which may be usefully borne in mind by the promoters of Technical Education, that the Government of India have, in the Resolution published in last Saturday's *Gazette*, declared that the system of appointing Asiatics as probationers in the Geological Department must be abandoned. The reason given is that habits of observation and practical inquiry are not sufficiently developed in natives by the present system of education. We are aware that the late Director of the Geological Department, Mr. Medlicott, took a still more hopeless view, and insisted that original investigation of high class could never be expected from the native of this country at all. The Government of India have never accepted this conclusion. Indeed, in the Resolution just quoted, they imply their belief that the qualities essential to independent and original work in the field of geological investigation can, and will, be produced by an improved system of school education. This view is confirmed by experience in the Forest Department, in which some of the students who have received a practical education in the field and in the museum, and whose powers of observation have been trained and stimulated by the instruction adopted at the Dehra Forest School have shown considerable aptitude for original research. It may be hoped that the reforms now being introduced into the general educational system of India, will remove from it the charge of being unable to turn out students fitted for the important work of scientific research, on which the future development of the wealth of the country so much depends.—(*Pioneer*).

# Sapless Cedar Block Paving.

In a paper recently read before the Western Society of Engineers and printed in the Journal of the Association of Engineering Societies, Mr. Thomas Appleton gives a brief account of the manufacture and durability of the sapless cedar block paving, or, in plainer terms, a pavement of cedar blocks from which the sapwood has been removed, now in use in the town of East Saginaw, Mich. Prior to 1886 the cedar paving blocks used were sawn from peeled cedar fence posts, the bark and knots only being removed. On most of the streets of the town the travel was not heavy enough to wear out this pavement before it perished by decay. This decay naturally took place soonest in the sapwood, which, being softer than the heartwood, broomed up and wore away, leaving a rounded top surface to the block, and making a very rough pavement in a few years. It was therefore decided to try a cedar paving block with the sapwood removed. The first of this was laid in 1886, and since that time no other kind has been used. An examination of the sapless block paving laid in 1886, made in October, 1892, showed that the blocks were sound on all sides, and that there had been very little brooming. Details of the manufacture and cost of these sapless cedar blocks are given as follows by Mr. Appleton :—

In manufacturing the sapless blocks, the cedar is first sawed into block lengths. It is not necessary to remove the bark, as it comes off with the sapwood. The blocks are then taken to a press or punching machine. The bed of this machine has holes 4 in., 5 in., 6 in., 7 in., 8in., 9 in., and 10 in. in diameter. At the top of these holes circular collars or knives are secured, standing up 2 in. or 3 in. above the bed plate. A block is placed on one of these knives, and the plate descending forces the block down through the hole in the bed, while the sapwood and bark is shaved off above the bed. The intention is to take off all the sapwood and no more, so that the attendant places the block over the largest die that he thinks the heartwood will fill. In case he misjudges the size of the heartwood, and the resulting block still has some sapwood upon it, the block can be punched again through the next smaller-sized die, and the sapwood entirely removed. Generally, the defective blocks as they come from the punching press are taken to a second machine, which has one straight knife and other knives of various radii of curvature, and these fit in the bed, and remove the sapwood and bark or any decayed wood that may be on one side of the block.

The block from the punching press has a very pretty appearance. Each block is a perfect cylinder, with sides straight and true. No knots or bunches are left, so that they can be set close together in paving. Those that have passed through the second machine have equally straight sides, but their cross-section

is not always a true circle ; it may be a segment of a circle with a straight side. But there are plenty of places for split blocks, and long as the block are sound and free from sapwood it is not essential that they should all be exactly cylindrical.

The common cedar block is made only from small-sized trees, of such size as would be used for fence posts. The sapless block is made from any size of tree, large or small, solid or hollow-hearted. Any piece that has 4 in. of good heartwood goes into paving blocks, but the wood is all heartwood, and of good sound timber.

The average cedar block has from 25 per cent. to 35 per cent. sapwood upon it. Sap ¾ in. thick on a 7 in. block would make 24 per cent, sapwood. On a 4 in. block the same thickness of sapwood would make 34 per cent. of the entire area of the block. On some blocks the sapwood will run more than ¾ in. in thickness. Throwing away 34 per cent. of the material adds to the cost of the paving. A pertinent inquiry is, what does this sapless cedar block cost? On the first piece of cedar block paving in East Saginaw the extra cost for sapless blocks was 10 cents per square yard over the cost of common blocks. Recent figures for sapless block paving in some of our suburbs give a difference of 30 cents per square yard. It is understood that this latter difference is largely due to the cost of railway freight from the block manufactory in Michigan. If the blocks were manufactured in this city just as the common blocks are, this difference of 30 cents per square yard would probably be reduced.—*Timber Trades Journal.*

The American cedars are species of 'Thuja'

Hon. Ed.

## VII.—TIMBER AND PRODUCE TRADE.

## Churchill and Sim's Circular.

*MARCH 2nd, 1893.*

EAST INDIAN TEAK.—Remains in poor demand, the deliveries for the first two months of the year being only 1,401 loads as compared with 1,725 loads, and 2,859 loads in 1892 and 1891. For February this year, the figures are 773 loads, against 883 loads and 1,500 loads in the two previous years. The market has hardly varied in price, what is wanted being more business. Future prospects largely depend on the volume and the direction of the Admiralty requirements; if any considerable proportion of the supplies from Burmah are absorbed by these requirements, markets will be by no means over pressed for some to come.

ROSEWOOD, EAST INDIA.—Have been rather more enquired for, but the sales effected have been at easier prices.

SATINWOOD, EAST INDIA.—Logs, if large and well-figured, would realise fair prices, but for *planks* and *boards* there is no demand.

EBONY, EAST INDIA.—No sales have been made, as the demand continues very dull.

*PRICE CURRENT.*

| | | | | |
|---|---|---|---|---|
| Indian Teak | per load | £9 | to | £15 |
| Satinwood | per ton | £5 | to | £10 |
| Rosewood | „ | £5 | to | £9 |
| Ebony | „ | £5 | to | £8 |

MARKET RATES OF PRODUCTS.

(*Tropical Agriculturist, March 1893.*)

| | | | | |
|---|---|---|---|---|
| Cardamoms, Malabar | per lb. | 2s. | to | 2s.6d. |
| Croton seeds | per cwt. | 15s. | to | 20s. |
| Cutch | „ | 20s. | to | 32s. |
| Gum Arabic, Madras | „ | 50s. | to | 60s. |
| Gum Kino | „ | 110s. | to | 120s. |
| India Rubber, Assam | per lb. | 1s.7d. | to | 2s.3d. |
| „ Burma | „ | 1s.7d. | to | 1s.11d. |
| Myrabolams, Bombay | per cwt | 10s. | to | 11s.3d. |
| „ Jubbulpore | „ | 8s.9d. | to | 9s.6d. |
| „ Godavari | „ | 5s.6d. | to | 7s.3d. |
| Nux Vomica, good | „ | 8s. | to | 9s.6d. |
| Orchella, Ceylon | „ | 22s. | to | 28s. |
| Redwood | per ton | 60s. | to | 80s. |
| Sandalwood, logs | „ | £9 | to | £30 |
| „ chips | „ | £4 | to | £7 |
| Sapan wood | „ | 40s. | to | 90s. |
| Seed lac | per lb. | 9s. | to | 1s.4d. |

## The Wood Trade in India.

The Report of the Special Commissioner appointed by the Norwegian Government to inquire into the state of trade in India has been issued. According to this report wood is sold per ton of 50 cub. ft. and for a specification of Norwegian fir as follows, *viz.* : 25 ton $\frac{1}{2} \times 6$ in. actual measure ; 15 ton $\frac{3}{4} \times 6$ in. actual measure ; 10 ton $\frac{3}{8} \times 6$ in. actual measure, a price of £3 19s. per ton has been obtained. The Commissioner is of opinion that good trade might be established in staves, 3 in. × 2 in. × $\frac{1}{2}$ in. and has ordered samples to be sent from Scandinavia to India. At present the greater part of the trade is with Singapore. Ready made wooden houses sell well in India, but in this, says the Norwegian Commissioner "we cannot compete with the Swedes." (*Timber Trades Journal.*)

**Did any of our readers come across the Special Commissioner when in this country ?**

HON. ED.

## VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

### 1.—Gazette of India.

*24th February*, 1893.—No. 238F.—Special leave for three months, under article 348 of the Civil Service Regulations, is granted to Mr. R. H. C. Whittall, Conservator of Forests, 2nd grade, Punjab, with effect from 19th February, 1893.

Mr. C. F. Elliot, Deputy Conservator, 1st grade, Baluchistan, is temporarily transferred to the Punjab and appointed to officiate as Conservator, 3rd grade, in charge of the Punjab Forest Circle, with effect from the date on which he assumes charge of that appointment and until further orders.

Mr. J. H. Lace, Deputy Conservator, 3rd grade, Punjab, is appointed to be in charge of the current duties of the Punjab Conservator's Office, in addition to his own duties, till Mr. Elliott assumes charge.

Mr. A. V. Monro, Officiating Deputy Conservator, 4th grade, Punjab, is transferred temporarily to Baluchisthan, *vice* Mr. Elliott.

*3rd March*, 1893.—No. 298-F.—With reference to the Notification of this Department, No. 238-F. dated the 24th ultimo, Mr. Elliott assumed charge of the Office of Conservator of Forests, Punjab, on 27th February, 1893.

*17th March*, 1893.—No. 337-F.—With reference to the Notification of this Department, No 238-F., dated the 24th ultimo, Mr. P. J. Carter, Conservator of Forests, 3rd grade, Pegu Circle, Burma, is appointed to officiate in the 2nd grade of Conservators during Mr. Whittall's absence on leave, or until further orders, with effect from 19th February, 1893.

No. 339-F.—Furlough for one year, under Article 340 (*b*) of the Civil Service Regulations, is granted to Mr. F. B. Dickinson, Officiating Conservator of Forests, Berar, with effect from 25th March, 1893, or the date on which he may be relieved of charge of the Berar Forest Circle.

### 2.—Madras Gazette.

*25th February*, 1893.—K. Aswatham Naidu, D.D.R., Second-grade Forester, to be Fifth-grade Ranger from this date (temporary rank—Board's Proceedings, Forest No. 1067, dated 6th October 1892) and transferred to Kistna.

*26th February*, 1893.—Mr. E. C. M. Mascarenhas, Ranger on Rs. 50, North Coimbatore District, is granted privilege leave for one month, under article 291 of the Civil Service Regulations, from 10th March, 1893.

*6th March*, 1893.—The following officers have passed the Departmental Examination held in January 1893 in Parts (*a*) and (*b*) of para. 56 of the Forest Code :—

| | | |
|---|---|---|
| North Malabar Division | ... | A. G Macfarlane, Acting sub. *pro tem.* Forester on Rs. 40 (with credit). |
| South Malabar Division | ... | K. Raghava Nair, Forester, on Rs. 20 (with credit). |
| Nilgiri District | ... | M. Srinivasa Iyengar, Acting sub. *pro tem.* Forester on Rs. 30. |
| North Coimbatore Division | ... | A. P. McKoy, Acting sub. *pro tem.* Forester on Rs. 30 |
| Tinnevelly District | ... | A. G. Jesudasan Pillai, Acting sub. *pro tem.* Forester on Rs. 20. |

*10th March, 1893.*—No. 121.—Mr. A. W. C. Stanbrough, Acting Examiner of Forest Accounts, Madras, is granted privilege leave for three months, from or after 1st April, 1893, under article 291 of the Civil Service Regulations.

11*th March, Privilege leave* to M. R. Ry. Maduranayagam Pillai, Sub-Assistant Conservator, for three months, from 15th April 1893, under article 291 of the Civil Service Regulations.

13*th March, Leave on medical certificate* to C. Subramania Aiyar, Forest Ranger, Fifth Grade, Nerth Arcot District, for two months, from date of relief, under article 369 of the Civil Service Regulations.

18*th March*, 1893.—Mr. R. W. Rouse, Acting sub. *pro tem.* Ranger on Rs. 50 in Madura, to revert to his substantive rank as Forester on Rs. 40, until further orders.

18*th March*. 1893.—Srinivasa Chamberlain, Forester on Rs. 40, South Coimbatore, to act Sub. *pro tem.* Ranger on Rs 50, until further orders.

3.—BOMBAY GAZETTE.

9*th March*, 1893.—Messrs. A. Lucas and C. G. Dodgson respectively delivered over and received charge of the office of Forest Settlement Officer, Khandesh, on the 21st ultimo, in the forenoon.

18*th March*, 1893.—No. 2031.—Mr. R. C. Wroughton, acting Conservator of Forests, Third Grade, is allowed furlough for one year from the 6th May 1893, or from such subsequent date as he may avail himself of it.

4.—BENGAL GAZETTE.

14*th March*, 1893.—No. 1255.—Mr. C. C. Hatt, Assistant Conservator of Forests, 2nd grade, attached to the Darjeeling Forest Division, passed the Examination in Procedure and Accounts prescribed in section 78 of the Forest Department Code, on the 16th January 1893.

20*th March*, 1893.—No. 1378.—Mr. C. A. G. Lillingston, Deputy Conservator of Forests, in charge of the Chittagong Forest Division, is appointed to be Personal Assistant to the Conservator of Forests, Bengal, *vice* Mr. W. M. Green, Deputy Conservator of Forests, proceeding on furlough.

Mr. E. J. N. James, Extra-Assistant Conservator of Forests, third grade, attached to the Singhbhum Forest Division, is appointed to the charge of the Chittagong Forest Division, *vice* Mr. Lillingston.

Mr. F. Trafford, Assistant Conservator of Forests, attached to the Jalpaiguri Forest Division, is transferred to the Singhbhum Forest Division, *vice* Mr. James.

25*th March*, 1893 —In continuation of the notification dated 13th December, 1892, it is hereby notified that the following officers passed in the subject and standard mentioned against their names at the half-yearly departmental examination of Assistant Magistrate and others held in October 1892 .—

*Forest Officer.*

Mr. E. E. Slane ... ... Hindustani, Higher Standard.

5.—N. W. P. AND OUDH GAZETTE.

16*th March*, 1893.—No. 669.—Mr. F. A. Leete, Assistant Conservator of Forests, on special duty as Working Plans Officer in the

Kumaun Forest Division of the Central Circle, was transferred to the Direction Division of the same Circle, with effect from the 10th January, 1893.

No. 670.—Mr. F. A. Leete, Assistant Conservator of Forests, on special duty in the Direction Division of the Central Circle, is attached to the Garhwal Forest Division of the same Circle as Working Plans Officer, with effect from the 23rd February, 1893.

17*th March*, 1893.—No. 713 —With effect from the 28th November 1892, the date on which Mr. F. Beadon-Bryant returned from furlough and assumed charge of his duties—

Mr. B. A. Rebsch, Officiating Deputy Conservator of Forests, 3rd grade, to revert to Deputy Conservator of Forests, 4th grade ;

Mr. A. P. Grenfell, Officiating Deputy Conservator of Forests, 4th grade, to revert to Assistant Conservator of Forests, 1st grade.

22*nd March*, 1893.—No. 765 —Mr. Keshavanand, Extra Assistant Conservator of Forests, was on special duty in the Kheri Forest Division, from the 18th September to the 19th October 1892, both days inclusive.

6.—PUNJAB GAZETTE.

3*rd March* 1893.—No. 156.—Mr. G. S. Hart, Officiating Deputy Conservator of Forests, and Lála Jowala Parshad, Extra Assistant Conservator of Forests, respectively made over and received charge of the Umballa Forest Division on the afternoon of the 19th February 1893 consequent on the departure of the former on privilege leave for 21 days granted him in *Punjab Government Gazette* Notification No. 101 of the 7th February 1893.

8*th March* 1893.—No. 164.—Mr. A. M. Reuther, Deputy Conservator of Forests, is granted nine months furlough, under Article 371 (*a*) of the Civil Service Regulations, with effect from the 11th March 1893 or such subsequent date as he may avail himself of it.

Mr. Reuther made over charge of the Hazara Forest Division to Sadhu Singh, Extra Assistant Conservator of Forests, on the afternoon of the 25th February 1893.

No. 168.—Messrs L. Gisborne Smith and G G. Minniken, Deputy Conservators of Forests respectively made over and received charge of the Bashahr Forest Division on the forenoon of the 20th February 1893 consequent on the latter's return from the privilege leave granted him in *Punjab Government Gazette* Notification No. 31, dated 16th January 1893.

10*th March* 1893 —No. 181.—In continuation of Notification No. 564, dated the 9th December 1892, it it notified that the Lieutenant-Governor is pleased to appoint Babu Daulat Ram to be an Extra Assistant Conservator of Forests of the 4th Grade, with effect from the forenoon of the 18th February 1893, and to rank him immediately above Babu Sadhu Singh.

Babu Daulat Ram, on return from Jodhpur, reported his arrival at Lahore on the forenoon of the 18th February 1893, and was transferred thence to the Chenab Forest Division, of which he assumed charge on the afternoon on the 23rd February 1893, relieving Mr. R. J. P. Pinder, Deputy Conservator of Forests.

11*th March* 1893.—No. 184.—Messrs J. H. Lace and L. Gisborne Smith, Deputy Conservators of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the forenoon of the 3rd March 1893.

No 188.—Mr. L. Gisborne Smith, Deputy Conservator of Forests, was attached to the Direction Division from the forenoon of 19th October 1892 to the afternoon of 7th January 1893, and again from the forenoon of the 23rd February to the afternoon of the 2nd March 1893.

No. 192.—Mr. J. H. Lace, Deputy Conservator of Forests, Punjab, is granted furlough for 18 months, under article 340 (*b*) of the Civil Service Regulation, with effect from the 1st March 1893, or such subsequent date from which he may avail himself of it.

13*th March* 1893.—No. 198.—The Lieutenant-Governor is pleased, under Section 75 of Act VII of 1878 (The Indian Forest Act) to prescribe that the following rule shall be substituted for Rule 2, which is hereby cancelled, in the Rules published in Punjab Government Notification No. 533 F., dated 8th December 1879 :—

*Rule* 2.—The Forest Officers mentioned in the first column of the following schedule shall exercise the powers under the sections of the Act mentioned in the second column of the same opposite each class of officers respectively :—

| Class of Officers empowered | Section of the Act under which powers are given | Brief description of nature of powers conferred. |
|---|---|---|
| I.—All Deputy Conservators, Assistant Conservators and Extra Assistant Conservators when in charge of Forest Divisions. | 20 | To publish translation of Notifications of reserved forests. |
| | 25 | To notify seasons during which the kindling, &c., of fire is not prohibited. |
| | 45 | To notify depôts for drift timber, &c. |
| | 60 | To direct release of property seized. |
| | 82 | To take possession of and sell forest produce for Government use. |
| II.—All Deputy Conservators, Assistant Conservators and Extra Assistant Conservators. | 46 | To issue notice to claimants of drift timber, &c. |
| | 47 | To decide claims to drift timber, &c. |
| | 50 | To receive payments on account of drift timber, &c. |
| III.—All Deputy Conservators, Assistant Conservators and Extra Assistant Conservators, Forest Rangers and Foresters when specially authorized in that behalf by the Conservator of Forests. | 25 | To permit acts otherwise prohibited in reserved forests. |
| | 23 | To permit acts otherwise prohibited in protected forests. |

22*nd March* 1893.—No. 221.—*Notification.*—Mr. J. H. Lace, Deputy Conservator of Forests, relinquished charge of his duties as a

Working Plans Officer on the afternoon of the 11th March 1893 consequent on his departure on furlough for 18 months granted to him in Punjab Government Notification No. 192, dated 11th March 1893.

*24th March* 1893.—No. 228.—*Notification.*—Lala Jawala Parshad, Extra Assistant Conservator of Forests, and Mr. G. S. Hart, Officiating Deputy Conservator of Forests, respectively, made over and received charge of the Umballa Forest Division on the forenoon of the 15th March 1893, consequent on the return of the latter from the privilege leave granted him in Punjab Government Notification No. 101 of the 7th February 1893.

## 7.—Central Provinces Gazette.

*1st March* 1893.—No. 1.—Under the authority conferred on him by Secretariat Notification No. 3555. dated the 12th June 1890, the Conservator of Forests, Northern Circle, Central Provinces, appoints Forest Ranger Mohan Lall in the Betul Forest Division and Forest Ranger Mahomed Yassin in the Nimar Forest Division to exercise the powers described in Section 67 of Act VII of 1878 (as amended by Act V of 1890).

*14th March* 1893.—No. 1270.—Consequent on Mr. V. S. Menzies, Assistant Conservator of Forests, being incapacitated for duty by illness, Mr. Chunder Kumar Chatterji, Extra-Assistant Conservator of Forests, is appointed to the charge of the Nagpur-Wardha Division, with effect from the afternoon of the 5th January 1893.

## 8.—Burma Gazette.

*25th February* 1893.—No. 2.—With reference to Revenue Department Notification No. 26, dated the 24th January 1893, Mr. M. Kavanagh, Extra Assistant Conservator of Forests, made over, and Mr. T. H. Aplin, Deputy Conservator of Forests, assumed charge of, the Alôn Revenue subdivision, Lower Chindwin Forest division, on the afternoon of the 21st February 1893, as a temporary measure in addition to his other duties.

*23rd February* 1893.—No. 3.—With reference to Revenue Department Notification No. 66, dated the 23rd instant, Mr. J. Messer, Assistant Conservator of Forests, relinquished charge of his duties as Personal Assistant to the Conservator of Forests, Pegu Circle, on the afternoon of the 2nd December 1892.

*7th March* 1893.—No. 77.—In exercise of the power conferred by section 34 of the Upper Burma Forest Regulation, 1887, the Chief Commissioner extends the provisions of Rule 16 (*c*) of the Upper Burma Forest Rules to the Upper and Lower Chindwin districts in so far as it refers to Pyinkado.

*3rd March* 1893.—No. 4.—In this office Notification No. 19, dated the 18th October 1892, *for* "12th instant" *read* "12th September"; and *for* "16th instant" *read* "16 September."

*4th March* 1893.—No. 1.—With reference to Revenue Department Notifications Nos. 25 and 26, dated Rangoon, the 24th January 1893, Mr. D. L. K. Calderwood and Mr. M. Kavanagh, Extra Assistant Conservators of Forests, respectively made over and received charge of the Mandalay Revenue Subdivision on the forenoon of the 1st March 1893.

*14th March* 1893.—No. 3.—With reference to Revenue Department Notification No. 26, dated the 24th January 1893, and to this office Notification No. 13, dated the 24th February 1893, Mr. T. H. Aplin, Deputy Conservator of Forests, made over, and Mr. D. L. K. Calderwood, Extra Assistant Conservator of Forests, assumed charge of the Alôn Revenue subdivision, Lower Chindwin division, on the afternoon of the 4th March 1893.

No. 89 Mr. E. B. Powell, Extra Assistant Conservator of Forests, 4th grade, on probation, is confirmed in his appointment with effect from the 7th November 1892.

No. 90 (Forests.)—In this department Notification No. 64, dated the 29th April 1890, under the heading *Pyinmana district, for* "Pyinmana" *read* "Kyedaunggan."

*16th March* 1893.—No. 97.—The Chief Commissioner directs that, with effect from the 1st April 1893, that part of the Pakôkku district which is at present included in the Lower Chindwin forest division shall form part of the Yaw forest division.

*23rd March* 1893.—No 106.—The following temporary alterations of rank are ordered in the Forest Department, with effect from the 7th November 1892:—

Mr. H. N. Thompson, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator, 1st grade.

Mr. H. H. Forteath, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator, 1st grade.

No. 107.—The following posting and transfer are ordered in the Forest Department:—

Mr. C. Ingram, Extra Assistant Conservator of Forests, on his return from privilege leave, is posted to the charge of the Agency division, and Kado subdivision, Moulmain.

Mr. P. W. Healy, Extra Assistant Conservator, on being relieved by Mr. Ingram, is transferred to the charge of the Attaran subdivision of the Salween-Attaran Forest division.

9—ASSAM GAZETTE.

*10th March* 1893.—No. 1570J.—Mr. A. M. Long, Assistant Conservator of Forests, Kamrup Forest Division, on being relieved by Mr. H. G. Young, is placed in charge of the Sibsagar Forest Division.

*22nd March* 1893—No. 2963J.—With effect from the 28th July 1892, in consequence of the departure on privilege leave of Mr. D. P. Copeland, Provisional Deputy Conservator of Forests, Second Grade,—

Mr. H. G. Young, Provisional Deputy Conservator, Third Glade, to officiate as Provisional Deputy Conservator, Second Grade.

Mr. T. J. Campbell, Deputy Conservator, Fourth Grade, to officiate as Provisional Deputy Conservator, Third Grade.

10.—HYDRABAD RESIDENCY GAZETTE.

*2nd March* 1893.—No. 62.—The designation of Sub-Assistant Conservator of Forests having been superseded by that of Extra Assistant Conservator, by the orders contained in the Circular No. 18-F., dated the 29th July 1891, of the Government of India in the Revenue and Agricultural Department, the Resident is pleased to direct that in the rules issued under the Berar Forest Law, 1886, and published in *Residency Orders* Notification Nos. 193 and 194, dated the 6th June 1892, for the words "Sub-Assistant Conservator" wherever they occur, the words "Extra Assistant Conservator" shall be read.

*14th March* 1893.—No. 79.—Mr. Sreenivasulu Naidu, Extra Assistant Conservator of Forests, has been transferred from Basim to Amraoti, and placed in charge of the Amraoti Forest Division.

11.—MYSORE GAZETTE.

*22nd February* 193.—No. 14212—G. 3301.— Mr. Y. Sitaramaiya, B. A, Assistant Conservator of Forests, Mysore District, who was granted 10 days' casual leave in Notification No. 13584—G. 3133, dated 15th February 1893, having availed himself of only six days from the 9th to the 14th January 1893, the unexpired portion of the leave, *viz.*, 4 days, is hereby cancelled,

*19th March* 1893.—No. 15353.—G. 3671.—Under Article 171 of the Mysore Service Regulations, Mr. B. Srinivasa Rao, Sub-Assistant Conservator of Forests, Kolar District, was granted 3 days' casual leave of absence, with effect from the 9th February 1893.

*20th March* 1893 —No. 15518—G. 3713.—Under Article 172 of the Mysore Service Regulations, Mr. B. Ramaswami Iyer, Officiating Assistant Conservator of Forests, Kadur District, was granted casual leave of absence for 15 days from the 7th to 21st February 1893, both days inclusive.

No. 15522—G. 3717.—Under the terms of Article 172 of the Mysore Service Regulations, Mr. B. Ramaswami Iyer, Officiating Assistant Conservator of Forests, Kadur District, is granted privilege leave of absence for 2½ months, with effect from such date as he may avail himself of the same.

2. During the absence of Mr. Ramaswami Iyer on leave, Mr. B. Hira Singh, Forest Probationer, Shikarpur Sub-Division, is appointed to act for Mr. Ramaswami Iyer in the Kadur District, and Mr. M. G. Rama Rao, Forest Probationer, Shimoga District, to act for Mr. Hira Singh in the Shikarpur Sub-Division.